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Contents.

Contents.

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

GENERAL BOARD OF HEALTH

REPORT

ON THE

RESULTS OF THE DIFFERENT METHODS OF TREATMENT

PURSUED IN

EPIDEMIC CHOLERA

IN THE

PROVINCES THROUGHOUT ENGLAND AND SCOTLAND IN 1854

BEING SUPPLEMENTAL TO

THE METROPOLITAN REPORT,

ADDRESSED TO THE

PRESIDENT OF THE GENERAL BOARD OF HEALTH

BY THE

TREATMENT COMMITTEE OF THE MEDICAL COUNCIL.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
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Report on the Treatment of Epidemic Cholera in the provinces throughout England and Scotland in 1854, being Supplementary to the Metropolitan Report addressed to the President of the General Board of Health, by the Treatment Committee.

Supplementary Report on the Treatment of Cholera in 1854.

It is to be observed that in the body of the "Report on Treatment," the cases under examination were arranged in three classes, which the Committee proposed to consider separately.*

The two first classes, viz.:—

1st. Those which occurred in metropolitan hospitals.

2d. Those which occurred in metropolitan districts (not in hospitals).

Were so examined and arranged; but it was found that the materials for the third class, viz.,

3d. Those which occurred in the provincial districts, had not been wholly collected, and it was thought better to postpone the publication until the analysis could be complete. It is therefore now given in a supplementary form.

To this is appended an analysis of certain returns from metropolitan hospitals and other public institutions, which

* Although the plan on which the Inquiry has been prosecuted can scarcely be misunderstood, it may be well to explain, in regard to the classification of treatment, that every case has been arranged according to that remedy on which the practitioner appeared to have chiefly relied, which, therefore, might fairly be regarded as the prominent treatment; that is, in other words, where it appeared in the reports that certain medicines had been repeated, whilst other medicines or measures in the same case, had been used only occasionally or sparingly, that case has been placed in the class of treatment to which the former medicines belong, and the latter medicines have been recorded in the Tables as accessory or incidental measures. According to the mode of drawing up the returns, which on the late outbreak were forwarded to practitioners, no more precise classification was found to come within the range of possibility, and even in this, the only practicable mode of working the returns, the difficulty and labour have been excessive.

It must be obvious to every thinking person that actual doses could not be stated in the Tables without rendering the report immensely voluminous; on the present occasion, however, this difficulty had not to be considered, because, in the great majority of the returns, the doses were not furnished. The distinction between the two modes of giving calomel, whether in large doses, or in small ones frequently repeated, having been stated in the returns, has accordingly been noted in the Tables.

have been sent in to the General Board of Health since the Report on Treatment was printed.

Of 800 cases of cholera treated in the provincial districts of England and Scotland, of which—

418 cases occurred in England, and
382 ,, Scotland.

It appears that—

416 cases were treated by Alteratives,
162 ,, ,, Astringents,
207 ,, ,, Stimulants,
15 ,, ,, Eliminants.

Of 416 cases treated by Alteratives in the provincial districts throughout England and Scotland, of which 212 occurred in England, and 204 in Scotland, it appears that—

——	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In Total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 41 cases, calomel in small doses was given -	33	9	33	80·4	100·
in 2 with salines.					
9 internal stimulants.					
10 external stimulants.					
5 opium.					
2 opium by glyster.					
1 venesection.					
In 177 cases calomel in larger doses was given -	155	60	84	47·4	54·1
in 7 with salines.					
70 internal stimulants.					
18 external stimulants.					
5 hot air baths.					
8 venesection.					
76 chalk and opium.					
1 aperient.					
In 139 cases calomel with opium was given -	95	87	43	30·9	45·2
in 10 with salines.					
1 aperients.					
28 internal stimulants.					
84 external stimulants.					
1 hot air baths.					
3 venesection.					
In 47 cases other preparations of mercury were given	39	12	26	55·3	66·6
in 1 with salines.					
32 internal stimulants.					
4 external stimulants.					
3 hot air baths.					
4 opium.					
13 opium by glyster.					
In 12 cases salines were given - - -	9	3	9	75·	100·
in 2 with external stimulants.					
2 internal stimulants.					
1 hot air baths.					
1 opium by glyster.					

Of 162 cases treated by Astringents in the provincial districts throughout England and Scotland, of which 76 occurred in England, and 86 in Scotland, it appears that—

——	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In Total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 55 cases sulphuric acid was given - -	45	8	36	65·4	80·
in 4 with calomel.					
3 catechu and other astringents.					
9 opium.					
5 opium by glyster.					
17 external stimulants.					
35 internal stimulants. -					
3 emetics.					
In 27 cases nitric, nitrous and nitro-muriatic acids were given.	21	3	11	40·7	52·3
in 1 with external stimulants.					
1 internal stimulants.					
26 hot air baths.					
In 10 cases chalk mixture was given - -	6	0	6	60·	100·
in 3 with calomel.					
2 salines.					
4 catechu.					
3 internal stimulants.					
In 32 cases chalk and opium were given - -	18	14	13	40·6	72·2
in 13 with calomel.					
7 catechu.					
8 external stimulants.					
14 internal stimulants.					
2 hot air baths.					
In 12 cases opium was given - - -	7	5	6	50·	85·7
in 1 with calomel.					
4 catechu.					
5 external stimulants.					
4 internal stimulants.					
2 hot air baths.					
In 5 cases catechu, kino, &c. were given - -	5	2	3	60·	60·
in 5 with external stimulants.					
2 internal stimulants.					
3 calomel.					
3 opium.					
In 21 cases acetate of lead and opium were given. -	16	10	16	76·1	100·
in 9 with external stimulants.					
8 internal stimulants.					
1 an emetic.					
1 opium by glyster.					

Of 207 cases treated by Stimulants in the provincial districts throughout England and Scotland, of which 128 occurred in England, and 79 in Scotland, it appears that—

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In Total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 12 cases ammonia was given	10	1	9	75·	90·
in 1 with ether.					
2 chloroform.					
1 emetics.					
5 external stimulants.					
7 brandy, wine, &c.					
7 opium.					
In 125 cases ether was given	46	18	42	33·6	91·3
in 107 with opium.					
89 emetics.					
11 ammonia.					
1 chloroform.					
3 calomel.					
12 brandy, wine, &c.					
90 external stimulants.					
In 65 cases brandy was given	47	6	50	76·9	100+
in 1 with emetics.					
20 external stimulants.					
26 hot air baths.					
36 opium.					
2 calomel.					
In 5 cases other stimulants, chloroform, &c. were given.	5	3	2	40·	40·
in 1 with hot bath.					
2 opium.					

Of 15 cases treated by Eliminants in the provincial districts throughout England and Scotland, of which 2 occurred in England, and 13 in Scotland, it appears that—

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In Total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 15 cases castor oil was given	12	—	10	66·6	83·3
in 1 with opium.					
10 external stimulants.					
2 ice water.					
1 venesection.					

Table of the 800 cases treated in the provincial districts throughout England and Scotland, viz.—

In England - 418 cases.
In Scotland - 382 cases.

omitting the accessory remedies.

In England 212 } 416 cases treated by *Alteratives*.
In Scotland 204 }

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In Total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 41 calomel, small doses	33	9	33	80·4	100·
177 calomel, larger doses	155	60	84	47·4	54·1
139 calomel with opium	95	87	43	30·9	45·2
47 other preparations of mercury	39	12	26	55·3	66·6
12 salines	9	3	9	75·	100·

In England 76 } 162 cases treated by *Astringents*.
In Scotland 86 }

In 55 sulphuric acid	45	8	36	65·4	80·
27 other mineral acids	21	3	11	40·7	52·3
42 chalk mixture and chalk and opium	24	14	19	45·2	79·1
21 acetate of lead and opium	16	10	16	76·1	100·
12 opium	7	5	6	50·	85·7
5 catechu, kino, &c.	5	2	3	60·	60·

In England 128 } 207 cases treated by *Stimulants*.
In Scotland 79 }

In 12 ammonia	10	1	9	75·	90·
125 ether	46	18	42	33·6	91·3
65 brandy,	47	6	50	76·9	100+
5 chloroform	5	3	2	40·	40·

In England 2 } 15 cases treated by *Eliminants*.
In Scotland 13 }

In 15 castor oil	12	—	10	66·6	83·3

In a comparison of the total number of cases with the deaths, the order of success is as follows:—

Alteratives.

Calomel and opium	30·9
Calomel (larger doses)	47·4
Other preparations of mercury	55·3
Salines	75·
Calomel (small doses)	80·4

Astringents.

Mineral acids (except sulphuric acid)	40·7
Chalk mixture and chalk and opium	45·2
Opium	50·0
Sulphuric acid	65·4
Acetate of lead and opium	76·1

Stimulants.

Ether	33·6
Ammonia	75·0
Brandy	76·9

Eliminants.

Castor Oil	66·6

Per-centage of collapse cases, with the deaths; the more severe form of the disease:—

Alteratives.

Calomel and opium	45·2
Calomel (larger doses)	54·1
Other preparations of mercury	66·6
Calomel (small doses)	100·
Salines	100·

Astringents.

Mineral acids (not sulphuric)	52·3
Chalk mixture and chalk and opium	79·1
Sulphuric acid	80·0
Opium	85·7
Acetate of lead and opium	100·

Stimulants.

Ammonia	90·
Ether	93·
Brandy	100+

Eliminants.

Castor oil	83·3

TABLE of the Total Number of Cases (3,727) of Cholera treated in Metropolitan Hospitals* and Districts, and in the Provincial Districts throughout England and Scotland, showing the Per-centage of Mortality.

	Collapse Cases.	Consecutive Fever.	Deaths.	Per-cent. of Deaths: In Total Cases.	Per-cent. of Deaths: In Collapse Cases.
2,142 cases were treated by Alteratives.					
637 calomel small doses	416	94	315	49·4	75·7
767 „ larger doses	590	160	353	46·0	59·8
472 „ with opium	295	140	169	35·8	57·2
80 other preparations of mercury	59	17	42	52·5	71·1
186 salines	140	40	94	50·5	67·1
865 cases were treated by Astringents.					
488 sulphuric acid	307	65	235	48·1	76·5
27 other mineral acids	21	3	11	40·7	52·3
201 chalk mixture and chalk and opium	79	33	55	27·3	67·0
81 acetate of lead and opium	65	26	50	61·7	76·9
36 opium	15	14	11	30·5	73·3
13 preparations of iron and alum	7	2	6	46·1	85·7
19 gallic acid and other astringents	9	4	5	26·3	55·5
548 cases were treated by Stimulants.					
114 ammonia	90	18	70	61·4	77·7
154 ether	73	22	65	42·2	89·0
138 brandy	108	25	87	63·0	80·5
31 chloroform	23	7	15	48·3	65·2
111 other internal and external stimulants	80	16	50	45·0	62·
172 cases were treated by Eliminants.					
150 castor oil	134	19	104	69·3	77·6
21 emetics	21	1	17	80·9	80·9
1 olive oil	—	—	—	—	—

* The 179 cases in the Appendix, treated in Metropolitan Hospitals and other public institutions, are included in this Table.

Order of success in the different modes of treatment, in a comparison of the total number of cases with the deaths:—

	Per-centage of deaths in total cases.
†Gallic acid and other astringents	26·3
Chalk mixture and chalk and opium	27·3
†Opium	30·5
Calomel and opium	35·8
†Mineral acids (not sulphuric)	40·7
*Ether	42·2
External and internal stimulants	45·0
Calomel (larger doses)	46·0
†Alum and iron preparations	46·1
Sulphuric acid	48·1
†Chloroform	48·3
Calomel (small doses)	49·4
Salines	50·5
†Other preparations of mercury	52·5
Ammonia	61·4
†Acetate of lead and opium	61·7
Brandy	63·0
Castor oil	69·3
Emetics	80·9

In a comparison of the collapse cases with the deaths:—

	Per-centage of deaths in collapse cases.
†Mineral acids (not sulphuric)	52·3
†Gallic acid and other astringents	55·5
Calomel and opium	57·2
Calomel (larger doses)	59·2
External and internal stimulants	62·5
†Chloroform	65·2
Chalk mixture and chalk and opium	67·0
Salines	67·0
†Other preparations of mercury	71·1
†Opium	73·3
Calomel (small doses)	75·7
Sulphuric acid	76·5
†Acetate of lead and opium	76·9
Castor oil	77·6
Ammonia	77·7
Brandy	80·5
†Emetics	80·9
†Preparations of alum and iron	85·7
Ether	89·0

* In a large proportion of the cases, opium was given with the ether.
† Averages from a small number of cases.

Consecutive Fever.

Amongst the above-named 800 cases of Cholera in the provinces throughout England and Scotland, 234 cases of consecutive fever are reported to have occurred, or 29·2 per cent. Of these 75 occurred in England, or 17·9 per cent.; 159 occurred in Scotland, or 41·6.

Of the treatment of consecutive fever in the provinces,—

56	cases	were	treated with	salines,	of which 21 died.
22	,,	,,	mercurials	,, 6	,,
101	,,	,,	aperients	,, 8	,,
1	,,	,,	diuretics	,,	,,
21	,,	,,	stimulants	,, 14	,,
3	,,	,,	external irritants	2	,,
5	,,	,,	nourishment alone	2	,,
In 23 the treatment is not recorded				3	,,
2 were not treated by medicine				1	,,

Of 234 cases 57 died, or 24·3 per cent.: a general mortality not exceeding the usual average.

In England of 75 cases 23 died, or 30·6 per cent.

In Scotland of 159 cases 34 died, or 21·3 per cent.

In England 4 cases are reported to have gone into consecutive fever without having been in collapse.

In Scotland 77 cases are similarly reported.

The most successful mode of treatment in consecutive fever, according to the foregoing Table, appears to have been by aperients.

In examining the remarkable proportion of consecutive fever in Scotland, it appears that in one district, Paisley,* 103 cases of consecutive fever have occurred in 110 cases of cholera. 50 of these only had collapse; 60 cases of cholera, therefore, went into consecutive fever without having been in collapse.

In all these cases, calomel and opium were used as the prominent treatment in the previous stages: there is no evidence in the returns, on this most interesting topic, whether the opium was given in any unusually large doses.

Fever is reported to have been prevalent at Paisley during the outbreak of cholera; but allowing certain weight to this latter cause, for the large number of cases which passed from cholera into consecutive fever, it is still a question, as they were all treated with calomel and opium,

* All these cases occurred in the practice of one practitioner.

whether the opium was given in large doses; in the latter case, the result would seem to correspond with the large proportion of cases of consecutive fever in the metropolitan hospitals, in which the use of opium, combined with chalk, appears to have been attended with like results.

In the present stage of these statistical investigations, it is desirable to invite a careful comparison of the results here stated with those recorded at page 14 of the Metropolitan Report. In any future extension of the inquiry, the quantity of the opium to be given is a question to be investigated with especial care. Should accumulated evidence bear the same character as that now obtained, it may lead to a demonstration that collapse may be superseded by the early use of opium, and it may then become a grave consideration how far it may be safe to induce the alternative of consecutive fever as the less unmanageable stage of the disease.

Many weighty arguments are worthy of consideration whilst waiting for further evidence; as, for instance, whether the degree of severity of the collapse may not influence, in a corresponding degree, the severity of the consecutive fever; but the duty of the Committee does not permit them to discuss this subject further, they merely throw out a hint of the nature of the service which these and further statistical materials may render to medical science.

Simple and Choleraic Diarrhœa passing into Cholera.

Of simple and choleraic diarrhœa passing into cholera, in the provincial districts throughout England and Scotland,—

866 cases are recorded, of which
448 occurred in England,
418 „ Scotland.

Of the 448 cases in England, it is wholly unknown whether 348 were treated or not in either stage.

23 were known not to have been treated.
82 were known to have been treated by medicine, and passed into cholera.
In 6 cases diarrhœa is reported to have been "absent."

Of the 418 cases in Scotland, it is wholly unknown whether 189 cases were treated or not.

74 were known to have received no medical aid.
155 were treated by medicine in both stages, and passed into cholera.
In 4 cases, diarrhœa is reported to have been "absent."

Of 237 cases of diarrhœa passing into cholera, treated in the provincial districts, of which 82 occurred in England, 155 in Scotland, it appears that,

Alteratives.

18 cases were treated with calomel;
7 in conjunction with stimulants,
1 „ „ astringents;
79 cases were treated with calomel and opium;
3 with internal stimulants,
1 „ astringents,
1 „ venesection;
13 cases were treated with salines;
12 with astringents.

Astringents.

8 cases were treated with chalk mixture;
1 in conjunction with calomel,
1 „ „ aperients,
1 „ „ stimulants;
66 cases were treated with chalk and opium;
23 with calomel,
4 „ internal stimulants,
1 „ external stimulants;
10 cases were treated with sulphuric acid;
4 with opium,
1 „ astringents;
8 cases were treated with acetate of lead and opium;
5 cases were treated with opium.
13 cases were treated with other astringents.

Stimulants.

14 cases were treated with internal stimulants.

Eliminants.

3 cases were treated with aperients.

Simple and Choleraic Diarrhœa not passing into Cholera.

Of 1,642 cases of simple and choleraic diarrhœa, which have not passed into cholera, treated in the provincial dis tricts throughout England and Scotland, it appears that,—

Alteratives.

57 cases were treated with calomel; 1 died;
- 36 in conjunction with aperients,
- 3 „ „ aromatic confection,
- 2 „ „ salines,
- 5 „ „ stimulants.

338 cases were treated with calomel and opium; 13 died;
- 7 in conjunction with aperients,
- 160 „ „ aromatic confection,
- 46 „ „ other astringents,
- 2 „ „ salines,
- 32 „ „ stimulants,
- 14 „ „ external warmth.

13 cases were treated with other preparations of mercury.

18 cases were treated with salines;
- 2 in conjunction with opium,
- 1 „ „ other preparations of mercury,
- 1 „ „ stimulants,
- 8 „ „ external warmth.

Astringents.

212 cases were treated with chalk mixture; 3 died;
- 5 in conjunction with calomel,
- 16 „ „ other preparations of mercury,
- 77 „ „ aromatic confection,
- 7 „ „ other astringents,
- 68 „ „ aperients,
- 4 „ „ stimulants,
- 3 „ „ external warmth.

412 cases were treated with chalk and opium; 16 died;
- 16 in conjunction with calomel,
- 36 „ „ other preparations of mercury,
- 38 „ „ mercurial aperients,
- 5 „ „ other aperients,
- 1 „ „ aromatic confection,
- 152 „ „ other astringents,
- 3 „ „ tonics,
- 18 „ „ stimulants,
- 3 „ „ external warmth.

363 cases were treated with sulphuric acid; 5 died;
- 61 in conjunction with opium,
- 9 „ „ calomel,
- 4 „ „ other preparations of mercury.
- 2 „ „ mercurial aperients,
- 4 „ „ astringents,
- 3 „ „ stimulants.

22 cases were treated with nitrous acid, in conjunction with stimulants.

63 cases were treated with acetate of lead; 2 died;
- 57 in conjunction with opium,
- 1 „ „ mercurial aperients,
- 1 „ „ other aperients,
- 4 „ „ astringents,
- 21 „ „ stimulants,
- 1 „ „ external warmth,
- 1 „ „ calomel.

53 cases were treated with opium; 3 died;
- 1 in conjunction with other preparations of mercury,
- 5 „ „ aperients,
- 4 „ „ mineral acids,
- 2 „ „ tonics,
- 2 „ „ stimulants,
- 18 „ „ external warmth.

5 cases were treated with persesquinitrate of iron;

4 cases were treated with other astringents, catechu, kino, &c.;
- 3 in conjunction with opium,
- 1 „ „ mercurial aperients.

Stimulants.

68 cases were treated with stimulants; 5 died;
- 3 in conjunction with tonics,
- 18 „ „ opium,
- 28 „ „ other preparations of mercury,
- 4 „ „ aperients.

5 cases were treated with external stimulants.

Eliminants.

5 cases were treated with castor oil;
- 4 in conjunction with opium,
- 1 „ „ stimulants.

4 cases were treated with other aperients;
- 3 in conjunction with mercury.

TABLE of CASES of SIMPLE and CHOLERAIC DIARRHŒA treated in the Provincial Districts of England and Scotland, which have not passed into Cholera, and also of Cases which have passed into Cholera; with the relative Per-centage of Failure to stay the Disease in its earlier stages under each mode of Treatment.

TREATMENT.	Cases of Diarrhœa which have not passed into Cholera, treated in the provincial districts of England and Scotland.		Cases of Diarrhœa which passed into Cholera, treated in the provincial districts of England and Scotland.	Total Cases of Diarrhœa treated in the provincial districts.	Per cent. of failure.	Or if the Deaths are included as failures.
	Cases.	Deaths.				
ALTERATIVES.						
Calomel - - -	57	1	18	75	24·0	25·3
Calomel with opium -	338	13	79	417	18·9	22·0
Other preparations of mercury -	13	—	—	13	—	—
Salines - - -	18	—	13	31	41·9	—
ASTRINGENTS.						
Chalk Mixture - -	212	3	8	220	3·6	5·0
Chalk and opium -	412	16	66	478	13·8	17·1
Sulphuric acid with and without opium -	363	5	10	373	2·6	4·0
Nitrous acid - -	22	—	—	22	—	—
Acetate of lead with and without opium -	63	2	8	71	11·2	14·0
Opium - - -	53	5	5	58	8·6	13·7
Other astringents—catechu, kino, &c. -	9	—	13	22	59·0	—
STIMULANTS.						
Internal and external -	73	5	14	87	16·0	21·8
ELIMINANTS - -	9	—	3	12	25·0	—

Thus the order of per-centage of failure to stay the disease in its earlier stages, or in that of premonitory diarrhœa, is as follows:—

	Per Cent.	Or, including the Deaths as Failures, per Cent.
Catechu, kino, &c. - -	59·	59·
Salines - - - -	41·9	41·9
Eliminants - - -	25·0	25·0
Calomel - - - -	24·0	25·3
Calomel and opium - -	18·9	22·0
Stimulants - - -	16·0	21·8
Chalk and opium - -	13·8	17·1
Acetate of lead and opium -	11·2	14·0
Opium - - - -	8·6	13·7
Chalk mixture - - -	3·6	5·0
Sulphuric acid and opium -	2·6	4·0

The Returns from which the foregoing results have been obtained, have been filled up by the several practitioners, especially by those in Scotland, with considerable care and attention to the directions sent with the papers by the General Board of Health. The averages require little comment, except that on the whole they correspond with the average results of the Metropolitan Reports.

In this supplementary Report a Table is furnished (page 7) giving a collective statement of the whole number of cases examined in the Metropolitan Report, combined with the provincial cases noticed in the supplement and the metropolitan cases in the Appendix. It is worthy of remark, that the general averages of the cases, including the provincial, maintain exactly the same position in the order of success as was displayed in the Metropolitan Returns, with the single and small exception of sulphuric acid, which now precedes castor oil, leaving the latter to occupy the lowest place.

The two results are seen together, thus:—

	Per-Centage of Deaths in Total Cases.	
	Metropolitan Per-Centage.	Metropolitan and Provincial combined Per-Centage.
Of Eliminants - - - -	71·7	76·0
Stimulants - - - -	54·0	52·3
Alteratives (calomel and opium) -	36·2	35·8
Astringents (chalk and opium) -	20·3	27·3

	Per-Centage of Deaths in Calapse Cases.	
	Metropolitan Per-Centage.	Metropolitan and Provincial combined Per-Centage.
Calomel and opium - - -	59·2	57·2
Calomel (large doses) - - -	60·9	59·2
Salines - - - -	62·9	67·0
Chalk and opium - - -	63·2	67·0
Calomel (small doses) - - -	73·9	75·7
Castor oil - - - -	77·6	77·6
Sulphuric acid - - - -	78·9	76·5

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Analysis of Certain Returns of Cholera and of Simple and Choleraic Diarrhœa, treated in the Metropolitan Hospitals and other Public Institutions.

[*The Returns were sent in to the General Board of Health too late to be included in the former report.*]

Cholera.

Of 179 cases of cholera treated in Metropolitan Hospitals and other public institutions, there have been,—

60 cases treated by Alteratives.
47 „ „ Astringents.
61 „ „ Stimulants.
11 „ „ Eliminants.

Of the 60 cases treated by Alteratives in Metropolitan Hospitals and other public institutions, it appears that,—

——	Collapse Cases.	Consecutive Fever.	Deaths.	Per-cent. of Deaths, In Total Cases.	Per-cent. of Deaths, In Collapse Cases.
In 12 cases calomel was given in small doses frequently repeated.	11	5	7	58·3	63·6
in 1 with salines.					
5 calomel in larger doses.					
2 opium.					
2 internal stimulants.					
11 external stimulants.					
8 hot air.					
10 emetic.					
10 ice.					
In 8 cases calomel was given, larger doses, at longer intervals.	7	1	8	10·0	100+
in 6 with salines.					
1 internal stimulants.					
1 external stimulants.					
2 hot air.					
1 emetic.					
2 ice.					
In 32 cases calomel with opium was given	16	7	17	53·1	100+
In 15 with astringents.					
2 salines.					
6 internal stimulants.					
5 external stimulants.					
9 hot air.					
7 emetics.					
7 ice.					

——	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths, In Total Cases.	Per Cent. of Deaths, In Collapse Cases.
In 8 cases salines were given	7	3	7	87·5	100·
In 1 with aperients.					
6 internal stimulants.					
3 external stimulants.					
6 hot air.					
1 opium by glyster.					
7 emetics.					

Of the 47 cases treated by Astringents in Metropolitan Hospitals and other public institutions, it appears that,—

——	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths, In Total Cases.	Per Cent. of Deaths, In Collapse Cases.
In 25 cases sulphuric acid was given	20	6	8	32·	40·
In 2 with calomel.					
9 opium.					
1 aperients.					
20 external stimulants.					
11 internal stimulants.					
9 emetics.					
17 hot air.					
18 ice.					
In 7 cases chalk with opium was given	6	3	5	71·4	83·3
In 2 with calomel.					
1 aperients.					
5 external stimulants.					
4 internal stimulants.					
3 hot air.					
In 1 case alum mixture was given with external and internal stimulants, emetic, hot air, and ice.	1	0	1	100·	100·
In 14 cases acetate of lead with opium was given.	14	3	11	78·5	78·5
in 1 with astringents.					
7 external stimulants.					
8 internal stimulants.					
2 emetic.					
10 hot air.					
12 ice.					
3 bismuth.					

Of the 61 cases treated by Stimulants in Metropolitan Hospitals and other public instututions, it appears that,—

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 3 cases brandy was given - -	—	1	—	—	—
In 1 with emetic.					
1 hot air.					
In 58 cases emetic, external stimulants, hot baths, and ice water were given.	57	11	31	53·4	54·3
In 2 with chloroform.					
3 calomel.					
2 ammonia.					
4 musk.					
1 camphor.					
6 creosote.					
1 internal stimulants.					
2 opium.					

Of the 11 cases treated by Eliminants, it appears that,—

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths. In total Cases.	Per Cent. of Deaths. In Collapse Cases.
In 11 cases castor oil was given - -	10	1	7	63·6	70·
In 10 with emetics.					
10 external stimulants.					
10 external warmth.					
10 ice water.					

Table of the 179 cases treated in Metropolitan Hospitals and other public institutions, omitting the accessory treatment.

60 cases were treated by *Alteratives*.

	Collapse Cases.	Consecutive Fever.	Deaths.	Per Cent. of Deaths, In Total Cases.	Per Cent. of Deaths, In Collapse Cases.
12 calomel, small doses - - -	11	5	7	58·3	63·6
8 calomel, larger doses - - -	7	1	8	100·	100+
32 calomel, with opium - - -	16	7	17	53·1	100+
8 salines - - - - -	7	8	7	87·5	100·

47 cases were treated by *Astringents*.

	Collapse Cases.	Consecutive Fever.	Deaths.	Per cent. of Deaths, In Total Cases.	Per cent. of Deaths, In Collapse Cases.
25 sulphuric acid - - - -	20	6	8	32·	40·
7 chalk and opium - - -	6	3	5	71·4	83·3
1 alum mixture - - - -	1	—	1	100·	100·
14 acetate of lead and opium - -	14	3	11	78·5	78·5

61 cases were treated by *Stimulants*.

3 brandy - - - -	—	1	—	—	—
58 emetic, external stimulants, hot baths, and ice water - - - -	57	11	31	53·4	54·3

11 cases were treated by *Eliminants*.

11 castor oil - - - -	10	1	7	63·6	70·

Comparing the total number of cases with the deaths, Astringents (sulphuric acid) stand at the head of the list.

The order of success in the treatment of the more severe forms of the disease, those namely, which were accompanied with collapse, is as follows:—

Sulphuric acid - - -	40·0
External stimulants, hot bath, and an emetic - - -	54·3
Calomel, in small doses - -	63·6
Castor oil - - - -	70·0
Acetate of lead and opium -	78·5
Chalk and opium - - -	83·3
Salines - - - -	100·
Calomel in large doses - -	100+
Calomel and opium - - -	100+

These average results differ considerably from those given in the former Tables of cases treated in Metropolitan Hospitals.

It should be understood by those who are not in the habit of studying statistics, that the above small number of cases can afford no means of arriving at a definite statistical result; since, were limited portions to be extracted at random from any large statistical numbers, they would in all probability show a very different average to the mean of the whole mass.

The following Table shows in the first column the per-centage of deaths in the total number of hospital cases, as given in the former Report; in the next column the per-centage of deaths, when to the foregoing are added the supplementary cases examined in the Appendix; the third column gives the per centage of deaths of the collapse cases, as in the former Report; and the fourth, the same added to the collapse cases of the Appendix, showing in how slight a degree the original average is influenced by the addition.

	Per-centage of Deaths.			
	In total Cases.		In Collapse Cases.	
	Former Average.	United Average.	Former Average.	United Average.
Alteratives.				
Calomel, small doses	50·0	51·5	76·1	73·3
Calomel, larger doses	48·2	49·3	56·7	58·0
Calomel and opium	41·9	44·5	62·8	70·9
Salines	50 3	52·5	64·0	66·3
Astringents.				
Sulphuric acid	57·6	54.3	79·6	74·1
Chalk and opium	30·5	37·2	64·7	69·5
Alum mixture	44·4	50·0	100·+	100·+
Acetate of lead and opium	55·5	69·5	83·3	80·0
Stimulants.				
Brandy	64·1	59·5	65·7	65·7
Internal and external stimulants	33·3	48·6	100·0	58·7
Eliminants.				
Castor oil	73·0	71·9	77·0	76·1

Consecutive Fever.

Of 41 cases of consecutive fever returned from the metropolitan hospitals and other public institutions it appears that—

In 7 cases the treatment was not known; 4 deaths.

11 cases were treated with salines; 6 deaths.
- 3 in conjunction with tonics,
- 3 ,, ,, stimulants,
- 1 ,, ,, ,, and local depletion,
- 1 ,, ,, ,, aperients and tonics,
- 1 ,, ,, local depletion,
- 1 ,, ,, general depletion,
- 1 ,, ,, saline injection.

1 case was treated with mercurials in conjunction with stimulants and opium;

1 case was treated with diuretics;

1 case was treated with tonics in conjunction with local depletion;

20 cases were treated with stimulants; 9 deaths.
- 2 in conjunction with external irritants,
- 4 ,, ,, astringents,
- 2 ,, ,, tonics,
- 3 ,, ,, local depletion,
- 1 ,, ,, ,, and tonics,
- 1 ,, ,, acetate of lead and opium.

Of 41 cases of consecutive fever, 32 cases had collapse, of whom 18 recovered and 14 died; 9 were without collapse, of whom 4 recovered and 5 died.

Simple and Choleraic Diarrhœa passing into Cholera.

Of simple cholera and choleraic diarrhœa passing into cholera in metropolitan hospitals and other public institutions, 180 cases are recorded.

In 90 of these cases it is wholly unknown whether they were treated or not in either of the stages of premonitory diarrhœa;

In 1 case diarrhœa is reported to have been absent;

33 were known not to have received any treatment;

56 were treated by medicine in both stages of diarrhœa, and passed into cholera.

Of the 56 cases of diarrhœa passing into cholera, treated in the metropolitan hospitals and other public institutions, it appears that—

Alteratives.

1 case was treated with calomel;

6 cases were treated with calomel and opium;
- 2 in conjunction with external stimulants,
- 1 ,, ,, astringents,
- 1 ,, ,, aperients.

2 cases were treated with salines.

Astringents.

10 cases were treated with chalk mixture;
- 2 in conjunction with aromatic confection,
- 3 „ „ aperients,
- 2 „ „ stimulants.

5 cases were treated with chalk and opium;
- 1 in conjunction with internal stimulants,
- 2 „ „ external stimulants.

7 cases were treated with sulphuric acid;
- 1 in conjunction with astringents,
- 1 „ „ aperients,
- 1 „ „ external stimulants.

1 case was treated with acetate of lead and opium in conjunction with external stimulants.

Stimulants.

18 cases were treated with stimulants (internal and external);
- 4 in conjunction with opium,
- 1 „ „ creosote,
- 2 „ „ aperients.

Eliminants.

6 cases were treated with aperients.

Simple and Choleraic Diarrhœa not passing into Cholera.

Of 296 cases of diarrhœa which have not passed into cholera, treated in the metropolitan hospitals and other public institutions, it appears that—

Alteratives.

1 case was treated with calomel;
42 cases were treated with calomel and opium;
- 3 in conjunction with aperients.
- 33 „ „ aromatic confection,
- 4 „ „ other astringents,
- 1 „ „ mineral acids,
- 1 „ „ stimulants.

46 cases were treated with salines;
- 5 in conjunction with calomel,
- 3 „ „ mercurial aperients,
- 9 „ „ other aperients,
- 25 „ „ external warmth

Astringents.

4 cases were treated with chalk mixture;
- 1 in conjunction with aperients,
- 1 „ „ external warmth.

97 cases were treated with chalk and opium, 5 died;
- 1 in conjunction with calomel,
- 1 „ „ other preparations of mercury,
- 20 „ „ mercurial aperients,
- 50 „ „ other aperients,
- 5 „ „ astringents,
- 4 „ „ stimulants,
- 5 „ „ external warmth

72 cases were treated with sulphuric acid;
- 24 in conjunction with opium,
- 3 „ „ calomel,
- 26 „ „ mercurial aperients,
- 5 „ „ other aperients,
- 5 „ „ astringents,
- 1 „ „ tonics,
- 6 „ „ stimulants,
- 2 „ „ external warmth.

7 cases were treated with acetate of lead;
- 7 in conjunction with opium,
- 5 „ „ mercurial aperients,
- 1 „ „ astringents,
- 1 „ „ mineral acids.

Stimulants.

5 cases were treated with stimulants;
- 1 in conjunction with opium,
- 3 „ „ mineral acids.

8 cases were treated with external stimulants in conjunction with emetic and ice.

Eliminants.

3 cases were treated with castor oil;
- 2 in conjunction with opium,
- 1 „ „ astringents.

Table of "Cases of Simple and Choleraic Diarrhœa" treated in the metropolitan hospitals and other public institutions, which have not passed into cholera, and also of cases of simple and choleraic diarrhœa which have passed into cholera, with the relative per-centage of failure to stay

the disease in its earlier stages, under each mode of treatment.

Treatment.	Cases of Diarrhœa which have not passed into Cholera.		Cases of Diarrhœa which passed into Cholera.	Total Cases of Diarrhœa.	Per Cent. of Failure.	Or if the Deaths are included as Failures.
	Cases.	Deaths.				
Alteratives.						
Calomel - -	1	—	1	2	50·0	—
Calomel with opium -	42	—	6	48	12·5	—
Salines - - -	46	—	2	48	4·1	—
Astringents.						
Chalk Mixture - -	4	—	10	14	71·4	—
Chalk and opium - -	97	5	5	102	4·9	9·8
Sulphuric acid with and without opium -	72	—	7	79	8·8	—
Acetate of lead and opium	7	—	1	8	12·5	—
Stimulants (internal and external) - -	13	—	18	31	58·0	—
Eliminants - -	3	—	6	9	66·6	—

The order of per-centage of failure to stay the disease in its earlier stages, is as follows:—

	Per Cent. of Failures;	or,	If Deaths be included.
Chalk mixture - - - -	71·4		—
Eliminants - - -	66·6		—
Stimulants - - - -	58·0		—
Calomel - - - - -	50·0		—
Acetate of lead and opium - -	12·5		—
Calomel and opium - - -	12·5		—
Sulphuric acid - - - -	8·8		—
Chalk and opium - - - -	4·9		9·8
Salines - - - - -	4·1		—

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GENERAL BOARD OF HEALTH.

MEDICAL COUNCIL.

Sutherland

REPORT

OF

THE MEDICAL COUNCIL

TO

THE RIGHT HON. SIR BENJAMIN HALL, BART., M.P.,

President of the General Board of Health, &c. &c. &c.,

IN RELATION TO

THE CHOLERA-EPIDEMIC OF 1854.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
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FOR HER MAJESTY'S STATIONERY OFFICE.

GENERAL REPORT

OF

THE MEDICAL COUNCIL.

To the Right Hon. Sir Benjamin Hall, Bart., M.P.,
President of the General Board of Health.

Sir,

In presenting our Report of inquiries conducted under your sanction into the course and phenomena of the late Epidemic of Cholera, the Medical Council may be allowed to express their satisfaction at Science having at length been recognised by the State as the ally of civil jurisprudence, and as the guide to a more enlightened code of medical police. They trust that this propitious movement may be regarded as the inauguration of a system ultimately destined to carry its ameliorating influence through all the ramifications of our sanitary institutions; and that the present fragmentary and imperfect application of medical knowledge in several departments of the State, may give place to a complete and comprehensive system, under the sole direction and control of one central department.

From the multifarious character of the objects embraced by this wide inquiry, it was found expedient to distribute them into several classes, and to entrust the examination of each class to a special section of the Council.

Of such special sections of the Medical Council, there were three: one, constituted to report on such *scientific inquiries* as it had seemed expedient to institute; a second, to digest from the general mass of contributed material whatever facts could illustrate the relative advantages of rival *methods of treatment;* a third, to invite from the cultivators of science in *foreign countries* any information which could be given as to the results of their kindred investigations.*

* The members of the three Committees were respectively as follows:

Committee for Scientific Inquiries.—Dr. Arnott, Dr. Baly, Dr. Farr, Mr. Owen, Mr. Simon.

Treatment Committee.—Dr. Alderson, Dr. Babington, Dr. Paris, Dr. Tweedie, Mr. Ward.

Committee for Foreign Correspondence.—Dr. Babington, Mr. Bacot, Sir James Clark, Mr. Lawrence.

As it was the paramount object of the Council to collect from members of their profession all the facts which medical observation and experience could afford; so was it their first duty to frame such a formula of instructions as might secure amplitude, accuracy, and technical uniformity in the returns they were thus desirous to obtain; and when we consider the crushing pressure under which our medical brethren laboured during the ravages of this fearful epidemic, too much praise cannot be accorded to them for the alacrity and goodwill with which they responded to the call.

In adverting to the results respectively obtained by the three Committees of their body, the Council must first express regret that their *Committee for Foreign Correspondence* have not been successful in their endeavours to elicit satisfactory information; but it may be justly pleaded that difficulties of no ordinary kind embarrassed all our inquiries, which no amount of zeal and diligence could overcome. It will be remembered that the Medical Council was not called into existence until the epidemic had already passed its culminating point: the way had not been sufficiently cleared by preliminary inquiries, and the prospective path of investigation had not been traced or enlightened by any scientific pioneers.

The Scientific Committee have collected some valuable information with regard to the past epidemics, and much more as a guide to future inquiry. This is more especially the case with respect to the impure condition of the London atmosphere, and its capability of influencing the intensity of an epidemic; to the foul state of the Thames, and its share in rendering the atmosphere impure; and to the farther intimate connexion between cholera and local sanitary defects. An inquiry still pending, but nearly completed, will, it is believed, show an equally close relation between the epidemic and the impurity of the water used as a beverage.

The various sources of atmospheric impurity are too well known to require enumeration, but there is one which, on account of its paramount importance, cannot be passed over without comment, viz., the present system of sewers. The Medical Council do not presume to judge of the merits of conflicting systems, or to decide which best fulfils certain theoretical conditions for the conveyance of a given volume of fluid; but they confidently assert that the existing sewers often fail in accomplishing their main object. Instead of carrying off almost inodorously the excrementitious and refuse matters

of the population, they evolve offensive effluvia, provoking general and grave complaint; and it is a fact worthy of remark, that the intensity of this nuisance is greatly aggravated in certain parts of the metropolis by obstructions to which their drainage is subject by reason of its outfall into a tidal river. The reckless disturbance of the contents of sewers, and their exposure on an extended surface, more especially pending an epidemic, is a practice which the Medical Council feel it necessary to reprobate.

The Scientific Committee lay great stress upon that source of impurity which results within dwellings from overcrowding the inhabitants, from defects of drainage, and from want of cleanliness and ventilation; and they deem it indispensable for the protection of the poor that the local authorities should vigilantly exercise the powers committed to them for preventing such evils. The good effects of sanitary improvements have been strikingly exemplified in the model lodging-houses, and in public baths and wash-houses. The establishment of burial-places beyond the boundaries of the metropolis is another circumstance of prime importance, and the relief thus afforded to overcrowded churchyards will, no doubt, be regarded by the future historian as one of the greatest improvements in the nineteenth century.

The Metropolis Local Management Bill, introduced by yourself, and already sanctioned by one branch of the Legislature, is a subject of sincere congratulation, since it promises efficient sanitary government for the metropolis; and it is to be devoutly hoped that similar measures, equally needed for the whole country, will speedily follow. All these considerations are forcibly pressed upon us by the probability that epidemics of cholera may be frequent, if they do not actually become persistent; as we are fearfully reminded that the interval between the epidemics of 1831–2 and that of 1848–9 was 17 years, whereas the late epidemic followed the second after an interval only of five years.

Nor are such measures to be regarded merely as safeguards against the invasion of cholera; they are equally applicable, and not less effective, against the spread of other epidemics, such as the varieties of continued fever and scarlatina, which have been lately stated by the College of Physicians to be far more destructive to human life than even the periodical scourge of cholera.

The Scientific Committee have taken pains to investigate the possible relations subsisting between the outbreaks of cholera and certain meteorological conditions. Mr. Glaisher's

elaborate report will be studied with great interest. If in a subject so obscured by inappreciable influences he has not succeeded in arriving at absolute demonstration, he has gone very far to establish high probabilities, which future observation may raise into certainties. And, here again let us remark, that his admirable system of observations could not be fully organized until the epidemic had already attained its climax. He has, however, shown, that during the three epidemics there has existed a great predominance of calm, rendering the season defective in those atmospheric changes which renew the purity of the air, and, at the same time, an undue height of the barometer, operating against vaporous diffusion; and further, a great excess in the temperature of the Thames at night, as compared with that of the superincumbent atmosphere, giving rise to nocturnal clouds of vapour, which are necessarily charged with impurities derived from the foul contents of the river. The great principle which was first laid down in Dr. Farr's Report to the Registrar General respecting the relative immunity enjoyed at particular altitudes may be connected with this new link of evidence. Mr. Glaisher has clearly shown that in the low-lying districts, wherein the epidemic assumed its highest malignity, the air was stagnant, and moisture, impregnated with impurities, was especially induced to hover.

Special examinations of the atmosphere were conducted by Dr. Thomson and Mr. Rainey, but their results possess little more than a negative interest, since they failed to discover any new or significant element of an organic or inorganic nature, as a possible agent in the causation of cholera.

The chemical and microscopical inquiries into the water-supply of houses and districts suffering from cholera have been investigated by Dr. Thomson and Dr. Hassall, and the results are embodied in the Report of the Scientific Committee; and as the period is now at hand when the water companies will be required to have their sources of supply amended, the Medical Council state that the facts before them show the necessity of a stringent enforcement of the provisions of the Metropolis Water Act, and of an inquiry as to how far these provisions are adequate to insure the purity and wholesomeness of the water supplied to the public. For the abolition of cesspools—in itself a sanitary advantage—has indirectly led to another evil. The excrements of the population are now to a great extent poured into the Thames; and, as might have been expected, our chemical and microscopical inquirers concur in stating that traces of this abominable

filth are found by them in the drinking-water supplied to a large part of the population.

The extraordinary irruption of cholera in the Soho district which was carefully examined by Mr. Fraser, Mr. Hughes, and Mr. Ludlow, does not appear to afford any exception to generalizations respecting local states of uncleanliness, overcrowding, and imperfect ventilation. The suddenness of the outbreak, its immediate climax, and short duration, all point to some atmospheric or other widely diffused agent still to be discovered, and forbid the assumption, in this instance, of any communication of the disease from person to person, either by infection or by contamination of water with the excretions of the sick.

In undertaking the pathology of the disease the Committee for Scientific Inquiries laboured under the disadvantage to which we have frequently adverted—the delay of all inquiry until the epidemic had already passed a climax; for, as they justly remark, "in order to obtain large results, it is most desirable that such inquiry should be commenced at an early period of the epidemic, and that, moreover, it should to some extent be continued in the absence of the disease which they aim at elucidating." Forms of instruction were, however, as speedily as possible prepared for circulation in order to obtain returns as to the stages of the disease, its duration, fatality, and relative frequency. A considerable amount of information was thus collected, and will be found embodied in a tabular form.

The duties of *the Treatment Committee* consisted, in the first place, in the invention of a mode by which the individual experience of practitioners might be brought under one comprehensive view, and thus has the science of statistics, for the first time, been applied on a large scale to medical treatment. The degree of faith which may be accorded to the inferences deduced by this method has been evidenced by the corroborative results of several separate sets of returns, or various materials separately worked, which have displayed corresponding results. The difficulty of devising a mode of extracting statistical facts from voluminous returns sufficiently shows that the work ought only to be considered as in the progress of development; and the same consideration justifies a belief that the farther prosecution of the inquiry, aided by the experience now gained, may carry it forward towards a far greater state of perfection, and elucidate truths of still greater value.

The facts elicited relate chiefly to the absolute inutility or relative inefficiency of certain classes of medicines and measures, thus clearing away valueless modes of treatment and redeeming from idle waste the few short and hurried, but precious, moments during which succour may be available, and securing that brief interval for the use of more promising means, or for others which are yet fairly open for judicious experiment.

There is one feature in this inquiry to which the Treatment Committee direct particular attention. It appeared to them that a most interesting line of investigation, promising valuable and instructive practical results, was opened by tracing the success of certain modes of treatment under which, according to their analysis of the evidence, the stage of collapse was avoided, and the far less dangerous alternative of consecutive fever was accepted.

It is much to be desired that a more extended body of evidence should be accumulated on this important topic, to which a scrupulously careful analysis should be applied. The prospect of discovering truths of high practical importance by this investigation is enhanced by the statement of certain corroborative facts enunciated in the Report of the Scientific Committee.

Statistical Tables are appended to the Report of the Scientific Committee, to which the Council desire to direct especial attention, as they exhibit a compendious summary of the extent of the epidemic, its duration, its comparative mortality in different districts, and at different ages.

In concluding our Report, and thus bringing the duties of the Medical Council to a termination, we most earnestly, but respectfully, urge upon the Government the paramount importance of pursuing with unabated diligence that path of investigation which Science sanctions, and into which the circumstances of the late epidemics had directed and guided us.

That which has been so repeatedly and wisely urged regarding the removal of accumulating filth, and the correction of nuisances, during intervals comparatively free from disease, may be pleaded with equal truth as to the necessity of an uninterrupted continuance of scientific inquiries duirng the same seasons of immunity, from which alone can we reasonably expect to obtain the requisite data for a true theory of the causes, or a wise plan for the cure of any future epidemic.

From regarding the future necessity for continued and competent investigation, the Council gratefully recur to the assistance they have received under your presidency. The members cannot separate without recording the deep sense they entertain of the kindness and courteous attention with which, on all occasions, you have been pleased to accept their suggestions; nor can they refrain from expressing their regret that political changes are removing you from an office with which your name will remain identified, and from the administration of laws which you have given so much pains to establish.

JOHN AYRTON PARIS,
Chairman.

General Board of Health,
July 26, 1855.

ON THE

Origin, Habits & Diffusion of Cholera

AND

WHAT MAY BE DONE TO PREVENT OR ARREST ITS PROGRESS AND TO MITIGATE ITS RAVAGES.

BY

SIR J. FAYRER, K.C.S.I., M.D., F.R.S.

Corresponding Member of the Academy of Medicine of France and of the Royal Academy of Medicine of Rome.

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ON

THE ORIGIN, HABITS AND DIFFUSION OF CHOLERA, AND WHAT MAY BE DONE TO PREVENT OR ARREST ITS PROGRESS, AND TO MITIGATE ITS RAVAGES.*

WHEN the Committee of your Association did me the honour of inviting me to address you on the subject of cholera, I hesitated to comply with the request, because it appeared to me at first sight unsuited to a general audience. On reflection, however, I thought that in a topic of such universal interest, which has been, nay is, so prominently before men's minds, I might find matter which would give effect to the wishes of the Committee and also be of service in conveying information which all should possess, with regard to the opinions they should form, the attitude they should assume, and the action they should take in behalf of the public weal, whenever cholera menaces or has actually invaded this or any neighbouring country. I propose therefore to give you some account of a disease which has extended its ravages over much of the earth's surface, and has destroyed so many of the human race; which is uncertain and apparently capricious in its incidence, terrible in the force and rapidity with which it often strikes, and obstinate in its resistance to therapeutic measures.

The true cause of cholera is still unknown, but the laws which affect its origin, propagation and diffusion have been so far ascertained by observation that, happily, the measures by which its progress may be stayed and its fatality mitigated are now well known to be within the scope of sanitary preventive operations. Moreover we are encouraged to believe that not only may it be disarmed of much of its present terrors, but that, in the future, we may anticipate a great diminution of its intensity, or, it may be, as in the case of such great epidemics as the "Black Death," and "Sweating Sickness," and others which desolated Europe

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in the middle ages, that it will take its place among the records of the past.

The subject of my lecture, then, will be the Natural History of a pestilence which is becoming yearly of greater interest, and I hope to tell you something which I trust may modify erroneous notions as to its character and attributes, and to shew you how you may help in preserving yourselves and others from its evil effects.

I have to tell you of a pestilence which sweeps over vast areas, leaving desolation in its track; whose origin, nay, even pathology, is still involved in obscurity; whose breath is fatal as the shade of the fabled Upas tree; whose mission is like that of the destroying angel of the Apocalypse. But I have also to tell you how its fatality may be diminished, and how a country—when duly prepared—may regard its approach with confidence, if not with indifference, not trusting in quarantine or other oppressive and restrictive measures, which are as noxious as they are futile, but placing firm reliance on the efficacy of Sanitary Science to cope with and overcome the evil, if only its practical teaching be attended to, for on that alone can any reliance be placed.

It may be well to make a few preliminary remarks for the benefit of those who do not already possess the knowledge, on what is meant by the terms epidemic, endemic, sporadic and zymotic.

The term *epidemic* is of Greek origin and signifies "upon the people"; it is applied to disease either when it is diffused far and wide, ranging over extensive countries and often leaping as it were by bounds to others, or when it spreads among more limited communities, following a definite track, dying out rapidly, or after one or more revivals or recrudescences, in the localities in which it had previously prevailed.

The term *endemic*, on the other hand, is applied to disease which is peculiar to certain localities, is always present, and depends on local causes; it may, under some conditions, assume the epidemic character, when it passes its ordinary limits and is diffused far and wide in varying degrees of intensity.

Sporadic, (from σπειρω, I sow) is applied to isolated cases which may occur anywhere, from causes peculiar to each case; such often herald the approach of the same disease in an epidemic form.

Cholera assumes all these forms; it occurs sporadically in

many places, is endemic in Bengal and other localities, and rages from time to time over various parts of the world in an epidemic form. The same may be said of the plague, small-pox, scarlet fever, and some other diseases. I use the term epidemic in its simple technical sense, as applied to disease prevailing and spreading among the people. As to what else may be implied hypothetically in the term, I have only to say that I understand it to mean something superadded, whether of atmospheric or cosmic origin, without which disease would not be generally diffused. This has been called (by Dunglison) "the epidemic constitution," whilst Léon Colin describes it as "a something isolated, impersonal, detached from the disease itself, the epidemic genius [constitution, influence], a certain creative force of the different epidemic affections, compelling, directing, extinguishing them."

These definitions, however, define nothing; the fact is we do not know the real nature of that which is implied in the term "epidemic influence or intensity"; but we do know that it means a potent—often the most potent—factor in diffusing disease. It may be, I suppose, referable to certain meteorological conditions, taking that expression in its widest sense; something either propagated in great telluric or aerial currents, or prevailing in cyclical periods simultaneously in various regions of the earth's surface; co-operating with local causes in conferring on the disease its quality of epidemicity, in some cases, perhaps, the combination itself acting as a cause.

Whatever this influence really be, epidemic prevalence does not occur without it, and this is so not only in such diseases as influenza or cholera (where the question of contagion is at least doubtful), but in the most contagious, such as scarlatina and small-pox; for it seems pretty certain, that whatever part contagion may play in the etiology of disease, it is of small importance relatively to this influence in diffusing the disease.

Dr. Southwood Smith has pointed out that there is much in common in the nature of epidemics, however they may vary in their special characters; that, in their propagation, development and diffusion they are subject to this influence. That in some, such as scarlatina and small-pox, there is a special exciting cause such as has conferred on them the term zymotic, cannot be questioned; but in others such as influenza or cholera, this is not so certainly made out, and

it is still a question to be solved, whether these may not owe their origin, as well as their diffusion, to more general causes.

Epidemics are fevers; "cholera is a fever which appears in its true character when not immediately fatal, and when time is allowed for the development of its successive stages." They resemble each other in the extent of their range and the manner of their diffusion. They sometimes give warnings of their approach by the outbreak of some milder epidemic, and, it has been said, "by the modification of the type of existing diseases, or by the transmutation of ordinary diseases into something more or less resembling that which is at hand." It would appear that they are occasionally preceded by influenza; this was the case in the visitations of cholera in 1831 and 1848.

They are sometimes actually in operation in a place before they assume their distinct form; *e.g.* diarrhœa may prevail before cholera breaks out. "They resemble each other in their migration;" advancing by leaps they come to their height, decline and disappear in one locality, attack another, pass through the same process, proceed to another and so on to a fourth, fifth, and sixth; the same resemblance is seen in the periodicity of their return.

The predisposing causes are external and internal.

External are vitiated air or water, overcrowding, sewer gases, stagnant subsoil moisture, and other insanitary conditions; such are also called "localizing causes." Internal causes are such as render the blood impure.

The atmosphere, without being vitiated by such causes, undergoes natural changes which predispose to the spread of epidemics. It is quite certain (says Dr. S. Smith) that there is an epidemic meteorology. Mr. Glaisher took the first steps towards bringing this matter within the purview of science, having studied it during three cholera epidemics. This department of Epidemiology is making progress and promises to yield important results. I may say it is now the subject of careful investigation by a well-organized Meteorological Department in India.

Variation in atmospheric pressure, extraordinary stillness of the atmosphere, deficiency in the tension of positive electricity or of rainfall, absence of ozone, fogs, blights, low forms of life in the air, all have been regarded as possible predisposing causes. Attention has been called more than once to the disappearance of birds from cholera-affected

districts at the beginning of the outbreak. The dreadful outbreak of cholera at Kurrachee in 1846 was (it is said) preceded by days of intense stagnation of atmosphere, and others have been preceded or attended by similar phenomena.

Some believe that the predisposing causes may themselves become efficient primary causes, and that the outbreak of epidemics may be prevented by placing the population under favourable sanitary conditions; that the prevalence of certain local causes in addition to certain general conditions of the atmosphere may bring about the changes in the person which are required to engender widespread disease; that the existence of a distinct primary cause is not necessary to account for the phenomena. The general opinion is, however, that joined to the predisposing causes there is a primary cause, a distinct entity, which may travel from one part of the globe to another, capable of spreading over space however large, or of confining itself to any space however small; such is the supposed cholera germ or particulate poison, said to be capable of increasing to any extent under favourable circumstances.

The advocates of this belief have been most energetic of late in their researches among bacterial life for the primary cause, and a therapeutic application of it has recently been witnessed in inoculation experiments for cholera in Spain, of the futility of which—by the way—there can be little doubt.

The specific germ or poison, from its analogy to ordinary ferments has been called "zyme," and hence the term *zymotic* given to epidemic diseases.

It is remarkable that while some epidemics spare the natives of the country and affect foreigners, others—such as cholera—affect all.

History of Cholera.—The epidemic which concerns us this evening is Cholera; let me give you a brief sketch of its history.

First as to the word itself:—Hippocrates uses the word "χολερη," this being the Ionic form of "χολερα."

The chief opinions as to its derivation are:—

1. From χολη = bile and ρυα = flux;
2. From χολερα = the gutter of a house.
   From χολας = an intestine.
3. From χολος = the old form of χολη, χολερη being 'η χολερη ν. = the bilious disease.*

* Macpherson. Annals of Cholera.

The Hindostanee and Arabic names are "murree" and "taoun" and "wubba," but these really mean "deadly pestilence," and the Chinese "ho-louan" and French "troussegalant" come under the same head. It is doubtful, however, if the latter were really cholera..

The specific names for cholera are generally derived from its most important symptom, *i.e.*, derangement of the alimentary canal. The oldest and most widely spread name is "haiza," a term common now in India where Hindostanee is spoken, used by Rhazes (900 A.D.), by Avicenna a century later, and by Averrhoës in the 12th century.*

The term found by the Portuguese in use at Goa was "mordeshee," and Europeans continued to use that term for some time under the forms "mordshi," "morshi," "morexi," "morexin," "mordexin," "mordeshin," and "mort de chien."*

The local names employed in the East are most of them descriptive of the characteristic symptoms, *e.g.*

Bengalee = Oola-oota.
Mahratta = Morshi, Tural.
Chittagong = Mou-pet.
Cashmeree = Dakee.
Malay = Moontaan.
Deccanee = Dank lunga.*

Let me now give a brief outline of the general characters of the disease itself; a clinical or pathological account would be out of place here, but enough must be said to render what follows intelligible.

There are certain erroneous notions about cholera, and one assigns that name to the disease in its most fully developed condition alone; now this is a mistaken conception, and one which gives an incorrect impression of its extent and fatality. The fact is that it presents many phases and symptoms, varying in gravity from simple malaise to profound collapse or the comatose condition of the worst forms of fever. Sporadic cholera is often spoken of as though it were a different disease to the epidemic, malignant, or so-called Asiatic cholera. I cannot stay to discuss this; for my own part, I believe cholera is cholera wherever it occurs, and its epidemic prevalence and intensity are phases or accidents in its history.

Cholera manifests itself in several stages or degrees, the

* Macpherson. Annals of Cholera.

earliest being merely malaise and general uneasiness; this is followed by the more serious symptom of bowel derangement, which soon passes into incessant catharsis and emesis of clear rice-watery fluid; this—very rapidly in some cases—causes a state of collapse which frequently proves fatal, or, if reaction occur, fever follows, with a variety of complications not less dangerous.

The mortality of cholera is great when it has advanced to the condition of collapse or secondary fever. In an epidemic, perhaps half die. Death is generally due to exhaustion from depression of vital energy and the loss of the serous part of the blood, from uræmic poisoning or from pulmonary or cardiac embolism, or from the complications attending consecutive fever. In some severe outbreaks death occurs very rapidly, as if from shock, in a few hours. The fatality appears to vary in different outbreaks, which are influenced in intensity by local causes as well as by epidemic force. The part played by meteorological conditions, no doubt, is important, and the effects of season and locality are marked, as I shall have to tell you later.

The suddenness and violence of some attacks are so remarkable as to make it obvious that some factor—apart from contagion or insanitary conditions—is at work. It has generally been observed that the cases at the outset of an epidemic are more numerous and fatal than later on, and as it gradually declines in intensity, the cases become less severe in character, next less numerous and severe, and finally cease altogether. This is not peculiar to cholera; it occurs in other epidemics, and was specially noted by Defoe in his account of the plague in London in the 17th century.

The patient's appearance and condition are strikingly significant when the disease has assumed its developed stage. The pinched, shrunken, livid face, hollow eyes with darkened areolæ, the cold clammy skin, the corrugated fingers, the cold breath, the sunken, hollow, husky voice, the incessant discharges, the raging thirst, the cramped extremities, the failing pulse,—all eloquently and sadly proclaim the true state and extreme danger of the sufferer. I shall give you some illustrations of the extent of this danger.

Now to proceed to the history of cholera. In the pre-Christian era cholera is described by Hindoos, Chinese, and Greeks.

Ancient writers on Hindoo medicine do not give a very

definite account of the disease, nor do they describe it in an epidemic form. The Ajurveda of Suçruta has a description of "Visuchika," generally supposed to be cholera, but later Sanscrit works say little on the subject.*

Records of Chinese medicine are usually considered to be contemporaneous with, or much earlier than Hippocrates (5th century B.C.). Ho-louan is the Chinese name for cholera; there is no evidence, however, of its having been known in China in an epidemic form.

Hippocrates describes cases of cholera: *e.g.*, those of Eutychides, Bias the pugilist, &c.;* but though affirming it to be more frequent at certain seasons, he describes no epidemic. Both he and the Chinese mention two forms—the damp and the dry.

The idea that cholera was known to the Hebrews proceeded from a wrong translation of the words "choli-ra," adopted in the Septuagint and Vulgate; this was rectified by Luther in his translation, and the idea is now abandoned.*

After the Christian era, cholera is frequently mentioned by Roman writers, Celsus, Aurelianus, and Aretaeus of Cappadocia; by later Greek writers, Alexander of Tralles, Paulus Ægineta; by Arab writers, Rhazes (A.D. 900), Avicenna, Averrhöes, Ali Ben Hossein of Bokhara (1364), &c.* The 13th, 14th, and 15th centuries are very barren concerning annals of medicine, but from Bernard Gordon, Raphael of Volterra, and others, we learn that cholera was a well known disease in Europe.*

In India it was not observed by Europeans before 1503, though an instance is given by Mr. Dowson in his edition of Sir Henry Elliot's "History of India," of what may have been cholera in 1325.*

In Europe, from the beginning of the 16th century, there are notices of epidemics of bowel affections and of a disease called "trousse-galant," which appeared in England and France in 1545. The earliest epidemic of cholera described by name occurred at Nismes in 1564. An outbreak at Ghent, in 1643, is described by Van der Heyden, and another occurred there again in 1665.† The epidemic that raged in London from 1669-82 is called by Sydenham

* Macpherson. Annals of Cholera.
† Macpherson, Op. cit., and Scoutetten, Histoire chronologique, topographique et etymologique du choléra.

cholera,* but by Wills only an aggravated form of dysentery.

According to Dr. Macpherson, cholera was present in various parts of Europe in a mild epidemic form during the 18th century, dying away towards the end, and remaining quiet during the first years of the present century. Previous to the 19th century, outbreaks in Europe seem to have been less severe and less widely diffused than those in India, but it must be borne in mind that the records of disease were very imperfect in those times.

In the East, cholera was first observed by the Portugese in 1503.† The first epidemic outbreak occurred at Goa in 1543; it was observed by Gaspar Correa, and the following is his description of it:—

"In the spring of this year there appeared a mortal throe, which those of the country call moryxy, common in all classes of people, no less to the child at the breast than to the octogenarian—to the stalled beast and the domestic fowls also, for it was common to all things living; nor could any reason be assigned for this agonizing infliction. The sound as well as the sick fell victims to it, and nothing did it respect. This dolour struck on the stomach; so grievous was the throe, and of so bad a sort, that the very worst kind of poison seemed to be taking effect, as proved by vomiting, with excessive thirst for water accompanying it, as if the stomach were parched up, and by cramps that were fixed in the sinews of the joints and in the soles of the feet, with pain so extreme that the sufferer seemed at the point of death. The eyes were dimmed to the sense, and the nails of the hands and of the feet black and curved. For this disease none of our physicians found a cure. The patient barely lived the day, or at the most the night through, in such sort that of 100 attacked scarcely 10 escaped, and they used native remedies. So great was the mortality that the bells tolled all day long. There were 12, 15, or 20 burials daily. At last the Governor ordered that the bells should be tolled no more, as their tolling increased the alarm. The Governor ordered the physicians to examine a dead body; but they found nothing in the body, but the stomach shrivelled up like a piece of leather."†

* Sydenham's Works, translated by Swan. Page 133.
† Macpherson. Annals of Cholera.

Compare this with epidemics of cholera that occur now and the identity will be apparent; the outbreak at Kurrachee, for instance, which will be described later.

In the 17th century a full account of the disease is given by Bontius, who describes it in Java in 1629; Zacutus Lusitanus notes its prevalence in Arabia; Baldaeus, a Dutch clergyman, refers to fatal cramps in his accounts of the coasts of India (1641); Cleyer noticed cholera in China in 1669; Thevenot was attacked by it near Surat in 1666, and Then Rhyne, a Dutch Professor, who wrote towards the end of the 17th century, mentioned a remedy employed against it in Japan.* Cholera appeared in an epidemic form in Mewar in 1661, in Marwar in 1681-82, in Goa in 1683-84.*

During the 18th century cholera visited in an epidemic form Pondicherry and the coast in 1768-69, and Ganjam and Calcutta in 1781; it appeared also in Java, China, and the Mauritius, and is reported to have occurred in an epidemic form at Tinnevelly in 1757, on the Malabar coast in 1782, at Hurdwar and Madras in 1783, at Travancore in 1792, and in Mewar and the Mahratta country in 1794.*

Of these epidemics the most widely extending was the outbreak at Ganjam in 1781; it branched off in a northerly direction, but was not traced further than Calcutta; it appeared in Central India and Hurdwar in 1783, in Madras in 1782, and extended as far south as Trincomalee. After this outbreak notices of the disease become rarer until the great epidemic of 1817.

I shall continue the history of cholera in a brief summary of its great epidemic movements since 1817 up to the date of that which is now hovering over Europe, and has recently manifested itself with great intensity in France, Spain, and Italy. These are, according to Hirsch, arranged in series called Pandemics.

The pandemic of 1817-23 was almost confined to Asia, Astrakhan being the only European locality attacked.

Cholera devastated India from end to end, attacked Ceylon, Mauritius, Réunion and the East coast of Africa (1820). It broke out in Burmah, Siam, several of the East Indian Islands, and finally in China and Japan in 1822. In 1821 the epidemic was at Muscat, in Mesopotamia and the North East provinces of Persia. In 1822 it appeared in

* Macpherson. Annals of Cholera.

the West of Persia, attacked the North of Syria, broke out in the following year in Palestine, in Antioch, in Damascus, in towns of the Transcaucasus, and in Astrakhan on September the 22nd.*

The second pandemic (1826-37) extended widely over Europe, Asia and North America, and appeared on the West coast of Africa.

In 1827 cholera was in Cabul, Balkh and Bokhara; in 1828 in Khiva and among the Kirghese hordes. East Russia was again the first European place attacked, cholera appearing in 1829 at Orenberg and Astrakhan: it became very widely diffused over Russia during 1830. During 1831 and 1832 the epidemic appeared in Turkey, and in all the Northern and Central countries of Europe—except Denmark—and attacked, for the first time, North America (Canada and the United States) in 1832.

In 1833 Spain and Portugal suffered and the epidemic was severely prevalent in the United States, and appeared on the Pacific coast and in Mexico.

At the end of 1834 cholera broke out in the South of France; appeared in South America for the first time in 1835, and in the same year in Italy, where it became widely diffused during 1836. During 1837 cholera was in Malta, Sicily, Austria, South West of Germany and Central America (for the first time). It died out, however, by the end of the autumn.

Besides the places already mentioned in Asia, cholera attacked China (1830), Japan (1831), Persia (1829), Mesopotamia, Arabia, Syria and Palestine.

In Africa, cholera appeared in Egypt (1831), Algiers, Abyssinia, Zanzibar, and some of the Soudan countries.*

The third pandemic (1846-63) extended over the whole of the Northern hemisphere to 25° South in the Old World and to 30° South in the New World.

It can be divided into two periods, 1846-50 and 1852-63.

During the first period (1846-50), in Asia, cholera was widely diffused over India, Turkestan, Afghanistan, Persia, Mesopotamia, the coast of Arabia, and Syria.

In Europe it appeared in Orenberg in 1847. With the exception of Spain and Portugal, the disease extended over the whole of Europe, but was not very widely prevalent in

* Hirsch. Handbook of Geographical and Historical Pathology.

the South and East of Germany, in Norway, Denmark, and Ireland.

In America, cholera appeared in New York and New Orleans at the same time (1848), and over-ran all the states to the east of the Rocky Mountains, and attacked San Francisco, Mexico (1849), California, Panama and New Granada.

In Africa, cholera was in Egypt and countries of the Northern coast.

There was a general lull from 1850-2, isolated cases only being reported in the north and north east of Europe.

During the second period, of places in Asia, India suffered severely in 1852-58-60-61; there were epidemics also in China, Japan, the East Indian Islands, Persia, Afghanistan and Turkestan.

In Europe, the disease appeared again in East Russia, Prussia and Poland. The whole of Europe suffered, the Northern and Central countries being the first attacked; the epidemic had died out by 1856, but re-appeared in Hamburg and on the shores of the Gulf of Finland in 1859, and a few cases occurred in England during the same year.*

In America, the area of epidemic prevalence was almost co-extensive with the northern continent. The disease appeared in South America, attacking Brazil for the first time (1855), and Venezuela; it broke out also in Central America.

In Africa, cholera attacked Algiers and Morocco (1853), Egypt, Nubia, Abyssinia, West coast of Madagascar (for the first time), Cape Verde Islands, Madeira, Mauritius and Réunion.†

The fourth pandemic (1865-76), can—like the preceding one—be divided into two periods, *e.g.*, 1865-69 and 1871-75.

In Asia, during 1863-64 cholera was widely diffused over India, Ceylon, the East Indian Islands, China, Japan, West and South coasts of Arabia (1865), Persia, Mesopotamia and Syria.

In Europe, the epidemic appeared in the summer months of 1865 in Malta, France, Italy, Spain, Belgium and Russia. In the latter country cholera was heard of every year till 1874. It subsequently invaded every nation in

* Cuningham. Cholera—What can the State do to prevent it?
† Hirsch. Handbook of Geographical and Historical Pathology.

Europe except Greece,—Denmark, however, being very slightly affected.

In America, the West Indies was the first locality affected (1865). During 1866 the disease was widely diffused over the United States, appeared in Central America and attacked the River Plate States and the west coast of South America for the first time; it was also prevalent in Bolivia, Peru, Brazil (1867-68), and British Honduras.

In Africa the epidemic was very widely diffused, attacking Somali land (1865), Zanzibar (1869), Madagascar, the Mauritius (1867), Egypt, Nubia and Abyssinia (1865), Senegambia (for the first time), Algiers, Tunis and Morocco.

During 1869-70 there was a lull, cholera persisting at very few points of the globe outside India; Russia, however, being one of the points.*

During the second period (1871-75) the Asiatic countries attacked were Persia (in which cholera had been present since 1856), Mesopotamia, Arabia, Turkestan, Bokhara, Syria (1875).

In Europe during 1871, cholera was gradually diffused through Russia. During 1872 and 1873, Russia, Poland, Prussia, Austria, Turkey and Sweden suffered severely; other countries suffered less and Denmark again escaped entirely. By 1874 the disease had died out in most countries of Europe, except in Hungary and other central parts.*

In America in 1873, cholera broke out in New Orleans and attacked many states on the banks of the Mississippi and in the interior plains.

In Africa, cholera appears during this epidemic to have been limited to Egypt (1871 and 1872) and Nubia (1872).†

A fifth pandemic which still continues, first appeared in Egypt during the summer and autumn of 1883.

It began at Damietta—where a fair had recently been held—and subsequently attacked Cairo and other towns, affecting so many districts that they could not be quoted in official returns. There was also an outbreak among the British troops at Suez.

The epidemic of 1883 was restricted to Egypt. The entire number of deaths is not given, but up to the end of July the deaths notified to Sir G. Hunter were 12, 600—the

* Cuningham. Cholera—What can the State do to prevent it?
† Hirsch. Handbook of Geographical and Historical Pathology.

real number being probably about twice that amount. The condition of the country is described as one of an extremely insanitary nature.

In 1884, cholera appeared at Toulon on June 18th, and a week afterwards it appeared at Marseilles, and subsequently attacked many towns—Arles, Aix, Perpignan, &c. —in the south east of France, where it continued till the middle or end of September.

During July it was gradually increasing in France, and appeared in a mild form at St. Petersburgh and Charkoff.*

In the beginning of August cholera was in Lombardy and by the end of the month was diffused over the greater part of northern Italy, raging most severely in Spezzia.

In September it appeared in Naples and was prevalent there in a virulent form throughout the month. In Italy, during the year there were 27,030 cases and 14,299 deaths.

In October cholera was dying out in all districts that it had yet attacked, but at the beginning of the month it broke out at Yport in Normandy, was reported in other parts of northern France, including Nantes, and finally appeared in Paris on November the 5th, where it was active till the end of the month, there being during that time in the city 971 cases and 866 deaths.

During 1884 cases occurred in two English ports,—Cardiff being one,—but failed to spread inland.

In 1885 cholera was prevalent in Spain from June to November, and during that time attacked nearly all the provinces of that country. It was first reported in the provinces of Valencia and Castellon during the last week of March; by the end of May it began to diffuse, attacking Madrid in June and spreading over many provinces, amongst them Saragossa, Toledo and Alicante. By the end of the month the mortality had reached 5,700.

During July many more provinces were involved, and the disease became much more severe in districts already attacked. The mortality for the month was not far short of 24,000.

At the beginning of August the epidemic was still increasing, but by the 7th it had reached its height and declined steadily during September. The mortality for August was 45,000 at least; for September rather more than 13,000. Twenty-four deaths took place within the British lines.

* Cuningham. Cholera—what can the State do to prevent it.

The total number of recorded deaths from cholera in Spain was 79,490, but 100,000 is nearer the real number. Valencia (13,400) and Saragossa (10,954) registered the greatest number of deaths.

Cholera appeared in August at Marseilles and Toulon; in November in Brittany,—Brest, and the immediate neighbourhood being affected.

Meanwhile, in September it had appeared in Parma, where there were 313 cases and 202 deaths, in Ferrara, Reggio, Massa, Rovigo, Genoa, Modena and Venice; during this year, however, in Italy, the disease scarcely reached the height of an epidemic.

In Sicily, cholera was prevalent during September and October; in the whole island there were 6,397 cases and 3,409 deaths, of which 5,535 cases and 2,959 deaths took place in the town and province of Palermo.

In 1886 up to this time, the epidemic has been comparatively inactive; there was an outbreak, however, at Tarifa, in the Straits of Gibraltar, in the first week of February, and between 700 and 800 cases of cholera have occurred in the province of Finisterre since the beginning of December, 1885. There are also rumours of the disease at Venice and Trieste, and it is not improbable that a fresh recrudescence will take place later on in the year. Our own island has hitherto been almost exempt, but no vigour should be relaxed in the observance of sanitary measures, by which alone we can prevent its development.*

Etiology of Cholera.—It is not without reason that some have suggested that cholera, influenza, and malarial fevers are only different manifestations of a common disease. They frequently prevail at the same time, and have such community of symptoms that it is sometimes difficult to determine between them, more especially in time of epidemic prevalence and in certain stages. Cholera frequently simulates malarious fever, and in certain epidemics in India it has been difficult to say to which the disease should be assigned. For instance, Dr. Ross, referring to the outbreak at Amritsar in 1881, says: "Fever in the city did not appear in an epidemic form until September; it was preceded by cholera about the beginning of August, of an

* The particulars of this epidemic are taken from various numbers of the *Lancet* for 1883-84-85, from the *Practitioner* for January, 1886, and from the *Morning Post* of Monday, February 8th, 1886.

extremely fatal type, and later on, when masked by fever, there was some difficulty in recognising it. . . . The two diseases, cholera and fever, supposing them to be distinct, masked one another so effectually, that diagnosis was extremely difficult at times."

Then again with reference to another outbreak, he says: "I observed in Kohat, in 1869, an outbreak of fever very similar to the Amritsar epidemic, followed by cholera. It was then observed also that it was an impossibility to tell when the cholera commenced, the symptoms of many cases of the fever being so similar."

It is admitted that season plays a great part in the etiology of fevers and influenza, and with regard to cholera, it is conceded that the character of the epidemic season, depending on meteorological influences, is important in determining the type of the disease.

The malaise or general discomfort in cholera, the premonitory, and next, the colliquative diarrhœa, vomiting and collapse, correspond to febrile malaise, the intermittent or algid state, and the remittent or pernicious bilious forms with collapse, in fevers; in influenza to the premonitory chills or malaise, the catarrhal, bronchial, febrile symptoms, and the depression and complications which often make the disease so severe in epidemics, so fatal—in some cases quite as fatal as cholera.

For instance, in 1564 there was a very destructive epidemic of influenza in Spain, during which 10,000 people died at Barcelona alone. The epidemic of 1580 was very widely diffused in the East, in Africa, and in Europe—affecting Denmark, Sweden, Germany, Hungary, Turkey, France, the Netherlands, Spain, and Portugal. In Paris alone 40,000 died.* Sir Thomas Watson writes, "On a cold night, says Maertens, the thermometer rose 30° F. in St. Petersburg; the next morning 40,000 people were taken ill with influenza, but every epidemic is not preceded by similar changes in the temperature, for, as Dr. Hancock observes, there has not been any uniform connection between any one sensible quality of the atmosphere—as to heat or cold, rain or drought, wind or calm,—and the invasion of the epidemic. Irregularities and vicissitudes of weather have, however, gone before the disease in very many instances, but sometimes one condition of the atmos-

* Hirsch. Handbook of Geographical and Historical Pathology, and Haecker, Epidemics of the Middle Ages.

phere, sometimes another has been its immediate forerunner, and the epidemic has frequently been observed to fall partially and capriciously, as a blight falls upon a field or a district. Petit informs us that in 1775 the disease in France was ushered in by thick noisome fogs, and I may here call to mind the dense fog which prevailed over this city in the raging of the distemper in 1857.

"Influenza travels or migrates from one place to another and holds for the most part to certain courses, in spite of opposite winds and variations of temperature. It has been noticed that it generally follows a westerly or north-westerly direction—in this resembling epidemic cholera. The body of the epidemic is preceded by dropping cases, like the droppings of a thunder shower, is most violent at its commencement, and is generally over in six weeks. Conjecture has not been idle as to its origin; one hypothesis assigns it to change in the electrical condition of the air, or to magnetic currents. Schönbein thought it was caused by abundance of ozone; all this is sheer hypothesis, but I have nothing better to offer you. That which commends itself to my own acceptance is the ozone hypothesis. The absolute mortality under the epidemic of 1857 has been immense, though the relative mortality was small. More persons have died in the present year (1857) than died of cholera when it raged in 1832." In these particulars there is a close analogy to cholera.

There are several theories of the causation of cholera; briefly expressed they are:—That a miasmatic poison is absorbed, either by the lungs or intestinal canal, which produces a primary disease of the blood, and that the virus multiplies and causes disturbance of the vital functions. What this virus is, or whence it comes, is not stated.

A second theory asserts that the diffusion of the disease is effected by human agency, by means of a poison in the persons or effects of those who have been exposed to it, this poison being inhaled, or swallowed in water or food.

The water theory assumes the propagation of cholera by means of drinking water which has been contaminated by the specific germ contained in cholera discharges; it has, universally, many advocates.

A modification of this theory assumes that, to produce cholera, the germ must be in a certain vibrionic stage of decomposition. This germ may be preserved in a dry state for years, but whether fresh or old, it undergoes rapid

changes in water. Oxidisation, acids, and certain degrees of temperature, both high and low, can render it harmless.

Pettenkofer believes that the cholera germ is developed in a damp, porous soil, impregnated with organic matter. The germ must remain in the soil some time before it acquires poisonous characters; it then rises into the air and effects an entry into the bodies of people by means of air, food, or water. The germs, further developed and multiplied, are expelled in an immature state, again get into the soil, and remain there till mature; in this way an epidemic is produced. In considering the effect of traffic on the transmission of cholera, he asserts that the dejecta are not the only means of spreading cholera, and that possibly, in that way, they are quite harmless. According to him, the above conditions, combined with personal susceptibility, must concur for the production of an epidemic.

In 1883, Dr. Koch investigated cholera in Egypt, and subsequently in Calcutta. The result of these researches led him to believe that he had discovered the germ in a comma-shaped bacillus. The doctrine of contagion was much emphasised thereby, and the dread of it enhanced; the fear was so great that Southern Europe became almost demoralised, and the necessity for quarantine seemed to be a logical result.

In May, 1884, the Secretary of State for India in Council instituted a special inquiry into the subject, and sent Drs. Klein and Gibbes to study the disease in India. In March, 1885, they sent in their report, and a committee was convened at the India Office to consider it.

This committee formulated the following conclusions:—that comma-shaped bacilli are usually found in the dejecta of persons suffering from cholera, but that there are no grounds for assuming that they are the cause of the disease, that they are, in fact, but epiphenomena, thus confirming the conclusions of Lewis and Cuningham, arrived at years before.

I may here say that most important and valuable researches into Bactereology are being prosecuted with great benefit to science generally and with infinite promise of good to that of medicine in particular; but I would ask the distinguished investigators to defer generalization until the data are more numerous and more certain, especially when such important issues as those attending the discovery of the primary cause of a disease like cholera are involved.

Another theory asserts the cause of cholera, to be an

influence, the origin of which is of a dynamic nature. Goodeve says: "May it not be a mistake to consider the specific cause at all as a simple body, either generated from without, and air-wafted to a particular spot, and then multiplying itself indefinitely, or as a locally-generated agent, and spreading over certain areas? Might it not be more in accordance with facts to suppose that neither a miasm from without nor a miasm from within, exclusively contains the specific poison? Might it not be that two factors are needed, the one some air-borne material or some dynamic modification of atmospheric elements coming from without, the other some local element, neither being potent unless united? The peculiar atmosphere sweeps along hither and thither, and it is only when it meets with the other peculiar substance that the poison is generated."

Dr. Bryden, whose vast opportunities of studying the disease, give great weight to his views, maintains that cholera has a permanent abode in certain areas of India, and in other districts is renewed by invasion from this area; that the cholera miasm is earth-borne and aerially conveyed; that the disease has no power of continuous manifestation throughout the year. He says also that it can be transmitted by means of fomites, but that the aggregate of cases so transmitted, cannot produce an epidemic. He considers the presence of the cholera miasm, of a humid atmosphere and of prevailing winds to be essential to the manifestation of an epidemic, and that its length of duration is proportional to the natural degree of humidity of the district. Reappearance subsequent to invasion being—he believes—under the control of the normal meteorology of the district invaded, its date can be anticipated according to the geographical situation of the district. Outbreak, that is local manifestation, is governed by the same laws as invasion.

None of these theories satisfactorily explain all the phenomena, and the primary cause of cholera is still unknown; much, however, has been learnt of the laws and development of the disease, and as to what should be done to prevent the outbreak and spread of an epidemic.

Men whose opinions differ concerning etiology arrive at similar conclusions with regard to preventive measures. For instance: it is almost universally admitted that improvement in sanitation and purity of water-supply are efficacious means for the prevention of cholera. One, however, advocates this from the belief that a cholera germ develops in

a soil impregnated with organic matter, and that the virus enters a man's system by means of the water he drinks, while another simply believes in good sanitation and purity of water as being essential for the preservation of that normal state of health in which people are not likely to become subject to cholera. So with quarantine. Those who do not believe in the contagion of cholera naturally consider it useless; while others reject it and because it cannot be efficiently carried out, whilst it brings with it many evils without preventing the spread of the disease.

In India where a sanitary service has now been established for twenty years, the policy of the government is to reject all theories of causation and propagation as a basis for practical sanitary work; guided by very large experience they have been taught, that in dealing with cholera, theories cannot be taken as a groundwork for any useful action on the part of the State; that by improvement in the condition of localities much good can be done, but that any attempt to carry the doctrine of contagion into practice has no good results, but is productive of much harm, not only because it involves oppression, but because it vastly aggravates all the evil it is intended to prevent. In India, accordingly, all cordons, quarantine, and even isolation of the sick have been discarded, reliance being placed on sanitary measures alone, and the result proves that the confidence is not misplaced; the following statistics taken from the reports of the Army Medical Department comfirm this:—

DEATH-RATE PER 1,000 FROM CHOLERA.

English Army, 1860-69.		1870-79.		1880-83.
Bengal ...	9·24	... 4·18	...	2·49
Madras ...	2·56	... 1·68	...	0·90
Bombay ...	4·80	... 1·53	...	0·45

Jail Population.

1859-1867	10·67
1868-1876	3·28
1877-1883	3·61

The belief in transmission by human intercourse is still firmly held by many of the highest authorities; few consider there is any danger of communication of the disease by mere contact or personal communication, but that the danger lies in the transmission of the germ, through water or other channel, from the internal economy of one person to that of another; hence contagionists insist on what all

admit the importance of, *i.e.*, purity of drinking water. For my own part, I am unable to accept this theory as a sufficient explanation of all the facts and phenomena, and would seek the solution of the problem in causes of a wider and more general character, looking for prevention to sanitary measures, and rejecting all others—especially of a coercive or oppressive character. Nevertheless, until contagion is absolutely disproved, I think the authorities are justified in adopting measures, which avoiding all oppression and undue interference with personal liberty, take precautions against possible sources of infection, but at the same time give full effect to all known practical measures taught by the sanitary science of the present day.

The evil results of the contagion theory have been manifested not only in the rigours and hardships of quarantine, whereby great suffering, much disease and incalculable damage to commercial interests have been effected, but in the general state of panic and demoralization which has deranged and degraded society generally. The state of the South of Europe during the recent cholera was pitiable, and the measures of fumigation, isolation, and general interference with personal liberty would have been ridiculous had they not been so pernicious. The same feeling still prevails in some parts of the world, and I quote an absurd example from the *Times* of January, 22, 1886. "Two Japanese sailors died from cholera during the short journey from Kobe to Nagasaki. Their dead bodies were thrown overboard. The Japanese authorities immediately forbade fishing along the coast."—*Sanitary Record.* It would not be difficult to adduce others equally absurd.

It is satisfactory to see that a considerable modification of these proceedings took place in Southern Europe during the latest manifestations of cholera last year; whether this be due to the conviction, forced upon people by recent events, of the futility of such proceedings, or to the impression made by the British and Indian delegates at the Roman Conference, in their emphatic declarations on the subject, I do not venture to say; but we recognize the change with satisfaction, for it points to a more thorough reform still, and gives hope that in time, methods which are worthy of the dark ages will give place to those adopted here and in India.

With reference to the question of the occurrence of the disease in the lower animals, Correa observed it in animals

and birds in 1543, and there was an epidemic of so-called cholera among cats at Delhi in 1875, when 500 cats were said to have died; another at Ahmednagar in 1881, and a third at Sirur in 1883.* It has already been noticed that more than once birds have deserted cholera-affected districts. Experiments made with a view of ascertaining the inoculability of cholera have, with a few doubtful exceptions, failed to communicate the disease to animals. On the whole, I should regard their susceptibility as doubtful.

Habits and geographical distributon of Cholera.—The history of the great epidemics of cholera shews that it has extended widely over the earth's surface, yet that there are regions which have escaped. These regions, according to Hirsch and Cuningham, are:

The whole continent of Australia, except perhaps the northern part.

The Islands of the Pacific;

In Africa: the east coast south of Delagoa Bay; southern and central divisions of the interior up to the Soudan; the west coast up to the Rio Grande; the islands of St. Helena and Ascension; the Cape of Good Hope.

In North America; all the country north of the 50th parallel.

In South America; the South Polar lands, the Falkland Islands, Terra del Fuego, Patagonia, Chili.

In Europe; Iceland, the Faröe Islands, the Hebrides, the Shetland and Orkney Islands, Lapland, Russia, north of the 64th parallel

In Asia; the Northern governments of Siberia and Kamschatka; it is uncertain about Mongolia and Manchooria.†

Places in India that cholera has not visited are:—

The convict settlement on the Andaman Islands (it has occurred in men landed from Calcutta, but not as an epidemic, or but very slightly), Mussoorie, Montgomery, Mooltan, Muzzaffurgurh, Dera Ghazi Khan, Sialkot and Nowshera* (very slightly).

European towns that have hitherto escaped are:—Würtzburg, Frankfort-on-the-Main, Olmütz, Falun, Rouen, Versailles, Lyons (slight epidemic in 1854), Sedan, Cheltenham.†

In treating this section of the subject it is necessary to refer to India, so commonly regarded as the home and

* Cuningham. Cholera—What can the State do to prevent it?
† Hirsch. Handbook of Geographical and Historical Pathology.

birth-place of cholera. In certain areas the disease is endemic; these areas are:—

Lower Bengal, including the deltas of the Ganges, Brahmaputra and Mahanuddy, bounded on the West by about 85°, on the East by about 91°, on the North by 27°, on the South by about 20° 10′; the interfluvial tracts of Behar; the deltas of the Irawaddy, Salwin, Godavery, Kistna and Kaveri; the Konkan and Malabar coasts; the southern half of the North West Provinces and Oudh; the Gurgaon, Delhi and Karnal districts between the Jumna and Sutlej; the Kangra, Gurdaspur and Amritsar districts between the Beas and Ravi; the Hoshiapur and Jullundur districts between the Beas and the Sutlej;* the cities of Madras and Bombay;† the valley of the Nerbudda and Tapti rivers.‡

Hunter's investigations shew that cholera is endemic in parts of Egypt;§ in parts of Russia and elsewhere in Europe there can be little doubt that it is so, and I cannot consider the chain of evidence which would trace it to India especially as being complete. It is continually present in England, as seen by the Registrar General's returns, and probably in many other countries, though the mortality is seldom so high as to attract notice, excepting when localizing causes and epidemic influence co-operate to develop an epidemic. It is customary to regard this cholera as another form of disease—Sporadic cholera or Cholera Nostras,—but there is probably no real distinction.

The influence of climate, rainfall and prevailing winds has been carefully considered, and its exact extent, though considerable, can hardly be estimated; roughly speaking, however, heat, moisture and a stagnant atmosphere combined are conditions favourable to the diffusion of cholera. Elevation has an influence, though less positive than relative, but cholera has occurred at Simla (7084 feet) and even higher.‖

The wide-spread distribution of the disease would indicate that the nature of the soil is not a very important factor, through some writers consider that cholera is less prevalent on sandy, porous ground and in deserts, on granite, metamorphic and trap rocks, on the laterite and

* Bellew. The History of Cholera in India.
† Aitkin. The Science and Practice of Medicine.
‡ Macnamara. A history of Asiatic cholera.
§ Hunter. Report on Cholera in Egypt in 1883.
‖ Hirsch. Handbook of Geographical and Historical Pathology.

volcanic formations, and, in England, on the primary geological formations.

Season has a decided influence, as shewn by the steady wave-like fluctuations of cholera mortality during different months, but the minimum and maximum mortality vary very much according to district. In some parts of India, such as the chief endemic area and Madras, there is a double seasonal wave; in districts where there is only one, the minimum mortality, generally speaking, occurs during the three months of November, December and January, the maximum in June, July or August.*

Outside India the disease is most active during the summer and autumn months.†

Admitting that cholera is more prevalent, active, and ever present in certain endemic areas of India, I do not consider it proved that that country is responsible for all the cholera which has overrun the world; yet such is the prevailing belief.

With regard to the spread of the disease, the theories of contagion and diffusion by human intercourse do not explain the movements of epidemics, for the history of the last fifty years shews, that though means of communication have been enormously multiplied all over India, as everywhere else, epidemics have neither increased in frequency, nor become more rapid in their progress, nor altered as to their general direction; in fact, of places that lie on the main line of traffic, many suffer little, while those that are most inaccessible often suffer most.*

Since 1877 records have been kept of the attendants on cholera patients in military and jail hospitals throughout India; it is found that 5,696 cases occupied 10,599 attendants, and that only 201 of these attendants were attacked, or 1.9 per cent.* The same immunity of attendants is shown by the statistics of the London Hospitals, in 1866, and it has been noticed that in the general hospital of Calcutta, where cholera cases are admitted indiscriminately with others, the disease has never spread.

With reference to dissemination, it has been asserted that, cholera breaking out in such an assembly as the Hurdwar Fair, on the dispersion of the pilgrims the disease has been diffused in all directions over the country; but, on careful analysis of facts, it will be found that although the pilgrims

* Cuningham. Cholera—What can the state do to prevent it?
† Hirsch. Handbook of Geographical and Historical Pathology.

affected on the spot have died in all directions whither they have travelled, that cholera has appeared in others only in the direction in which the epidemic was moving. Further, it has been found in reported cases of importation of cholera from one station to another, that the disease had already manifested itself in the district, before the particular case which was supposed to have imported it, had arrived. Wherever thorough investigation has been possible, it has been found that explanation based on the theory of contagion fails to account for the facts.

Since the opening of the Red Sea route in 1842, and the Suez Canal in 1869, Europe has suffered no more from cholera than it did before, though traffic has increased very much; and, notwithstanding the daily communication by ships with India through the Canal and Red Sea, no instance of an epidemic being conveyed to Europe by this route has occurred.*

During epidemic prevalence cholera never attacks all the places in the area over which it is diffused, but breaks out in but few of the inhabited towns and villages, sometimes leaping over places in the direct line of its course, and returning to them later during the same epidemic. It is a remarkable fact also, that in Bengal an epidemic always moves upwards,* not necessarily along the great lines of traffic or with the rivers, but rather against them. Frequently places attacked at the same time are widely distant, and this is constantly observed in Indian epidemics, only a comparatively small proportion of villages and towns being attacked in any large area where an epidemic, however intense, prevails.

Greatest intensity is often reached at the same time over widely extending areas. In Northern India in 1879, it was manifested not only by the number of different places in which the disease showed itself, but also by the high mortality.

Cholera seems to have an affinity for certain districts,—even streets and houses,—and the same house has been known to be twice the site of the first outbreak of an epidemic; there were several in Calcutta when I was there. It is worthy of notice also that certain trades, such as the tanner's, seem to confer a prophylactic influence. Everything points to locality as the most important factor in the

* Cuningham. Cholera—What can the State do to prevent it?

development of the disease, and to its being the most serious subject for consideration in dealing with an outbreak.

The apparent caprice and fluctuation of a cholera epidemic are shown by the following illustration from the "Report of the Sanitary Commissioner for the Hyderabad Assigned Districts for 1884":—

The mortality from cholera in these districts varies greatly in different years, *e.g.*, 87 deaths in 1884 were preceded by 27,897 in 1883, and it will be seen on comparing the returns since 1869 that a sudden fall like the one mentioned has happened two or three times, and that in only two instances (1870-71 and 1881-82) have the returns for two consecutive years been almost equal. These variations in intensity occur everywhere in India, and are not to be explained by any of the theories generally advanced; we know, however, that bad sanitation invites cholera and increases its severity, while a good sanitary state tends to keep it off, or to lessen the intensity of the epidemic. This fact was shown in the case of Spain last year, where the great cholera outbreak was undoubtedly connected with sanitary negligence.

It cannot be supposed, however, that the local or personal conditions of the provinces under consideration varied so enormously from year to year. One explanation was, that in a year of severe epidemic intensity, more susceptible people were carried off, leaving fewer to be attacked in a following year; but this view is not confirmed by statistics, and, in the absence of any certain knowledge, we must attribute the variation of mortality to variation in the intensity of the epidemic influence. To produce an outbreak of cholera, local and personal predisposing causes, as well as the epidemic influence, must be present,—the latter, however, being the the chief factor.

A province or a body of men is sometimes struck by cholera, the whole community being affected. The outbreak starts from a definite time, and the greatest mortality is compressed into a few days, generally at the very beginning. This does not result from the length of the attack, but from the virulence of the disease, which generally dies out sooner than in the typical outbreak.

I here give a few examples of such sudden outbursts.

The great epidemic which broke out among the troops of the army of Lord Hastings began on November the 7th, 1817, was in all parts of the camp on the 9th, and reached its height on the 17th. During the week in which it raged

most violently, 764 soldiers and 8000 camp followers died; the epidemic had ceased by the 22nd or 23rd of November.*

Another outbreak occurred in May, 1818, among the Nagpore subsidiary force. Between seventy and eighty cases were admitted the first day, and many were found dead and dying about the camp.*

Another instance is the great outbreak at Kurrachee in 1846. On Sunday evening, June 14th, there was a sudden change in the atmosphere, the wind veered from south-west to north-east, and a thick lurid cloud darkened the air. Later on in the evening cholera appeared in thirteen corps of the troops stationed there; it increased in violence till the 16th, when 277 cases were admitted, of which 186 died; after that date it gradually declined, 814 cases and 442 deaths having occurred between the 15th and 18th (inclusive).*

Without any premonitory symptoms, cholera appeared at Peshawur, at five o'clock on the morning of May 20th, 1867; from that day till the 23rd, the number of cases increased daily, and after that date decreased gradually, the last case being admitted to hospital on the 31st.*

A remarkably sudden outbreak occurred in an orphanage at Secundra, near Agra, on May 29th, 1867. The girls were caught in a sudden shower of rain, the elder ones being the most exposed to it. One of them was found dying at four o'clock the next morning, and subsequently 40 of them and 6 of the younger girls were attacked. Boys and girls were at once removed to different places; not one of the boys suffered. On May 30th, 16 cases were admitted; on the 31st, 15; between the 1st and 6th of June, 15; the disease then died out.

To turn to Europe. In an establishment for pauper children at Tooting, in 1849, there were crowded 1395 children, little more than 100 cubic feet of breathing space being allowed for each child. One night cholera attacked 64 of these children; 300 were attacked in all, and within a week 180 died.†

The epidemic of 1832, in Paris, commenced on the 26th of March, and increased so rapidly, that in eighteen days it had reached its climax, and had already extended to all

* Quoted from Bryden. Cholera in the Bengal Presidency from 1817 to 1872.

† Southwood Smith. The Common Nature of Epidemics.

the quarters of the city, and had been fatal to 7,000 people.*

The following tables show the absolute mortality of cholera, and its relative mortality, compared with certain other prevalent diseases in India ; from these it will be seen, that, bad as cholera often is, it occupies by no means the highest place in the death rate.

MORTALITY FROM CHOLERA IN INDIA.†
(Including Army and Jail population.)

Year.	Total Mortality.	Rate per 1,000.
1874	18,455	·887
1875	384,858	2·434
1876	486,667	2·628
1877	637,059	3·203
1878	319,451	3·6002
1879	271,071	5·335
1880	119,170	1·0949
1881	162,266	1·745
1882	351,408	1·5435
1883	249,244	1·551

MORTALITY AMONG THE GENERAL POPULATION IN INDIA.†

Year.	Rate per 1,000.			
	Fevers.	Bowel Complaints.	Cholera.	Small-pox.
1874	11·09	2·27	·08	1·26
1875	12·35	2·71	2·72	·78
1876	13·54	2·35	2·07	·66
1877	13·54	2·54	2·809	1·15
1878	19·80	1·959	3·53	1·49
1879	16·54	1·67	1·31	·96
1880	14·16	1·58	·367	·45
1881	14·82	1·70	·78	·37
1882	13·95	1·83	1·44	·71
1883	14·62	1·99	1·96	1·13

* Baly and Gull. Reports on Epidemic Cholera.
† Reports of the Sanitary Commissioner with the Government of India.

Before leaving this subject, it is necessary to refer to outbreaks of cholera on board ship. Cholera has frequently broken out in vessels in the harbours of affected ports, but has disappeared soon after the ship has gone to sea. On the other hand, in passenger, emigrant and troop-ships, it has made and makes its appearance from time to time, within certain periods after leaving the port,—these periods varying from two or three days to as many weeks. But, as the people on board have all been exposed to the influence of cholera before they left, we must assume that cholera was latent in them when they left.

In some cases, where the port of embarkation was not affected though the passengers came from a cholera affected district, and the disease spread to the crew, it is to be remembered, that the ship started from a country in which the epidemic influence was present, though not ostensibly in the port of embarkation.

This ship-cholera seems to give some support to the doctrine of contagion, but the truth most probably will be found to lie in the fact that the individuals attacked were cholerised before they left the country, and that insanitary local causes on board the ship developed that which was dormant in the individuals.

Dr. Sutherland, with reference to this subject, writes :—"The ship or the men must have been in a cholera locality. The men are the chief agents. They become cholerised, so to speak, and whether the disease lies dormant or shows itself, depends on other conditions being superadded. It would be another thing if cases such as these introduced an epidemic into a perfectly uncholerised country. But this has never happened; the *aura* must be there before the ships. We cannot tell yet what cholerisation is. We are seeking to know. But we do know that it is set up indigenously and without external importation."

He adds :—1. "A ship lying in an epidemic port may become part of the epidemic port after it has sailed, provided there be men on board who have also been in the locality. 2. A ship sailing on the free open sea may encounter a travelling epidemic and be struck thereby. This has happened in the Bay of Bengal, in the face of the Monsoon. 3. An epidemic may outstrip a steam ship, as happened at Malta, in 1865. 4. No cholera-struck ship ever landed an epidemic. 5. What is called the incubation period of cholera is not fixed but variable, and may require nothing but change of temperature to develop it."

Precautionary measures, general and special, against cholera.—Up to the present date the belief is maintained by foreign powers that epidemic diseases, and among them especially cholera, can be arrested in their progress and debarred from entering into a country by quarantine. This, as its name implies, and as you are probably aware, originally meant seclusion and isolation for a period of forty days, of persons either affected by a disease, or coming from a locality where it prevailed. Quarantine is based upon the assumption that the disease is communicable from person to person, either by means of the individual himself or of his effects. This, however, has been modified considerably in its application of late years, and the period of isolation has been much diminished, even by those who hold the doctrine of contagion.

It is unnecessary to describe minutely the evils that resulted from this grave interference with personal liberty; suffice it to say that they consisted of discomforts and horrors arising from the accumulation of people in Lazarettes, whereby great inconvenience and personal suffering were inflicted, with hindrance to commerce and the creation of foci of intensified disease, forming an accumulation of evils much greater than that they were intended to avert.

Still, could it be shown that by such measures, the propagation and diffusion of disease from nation to nation can be averted, their adoption, under proper management, and with precautions as to the personal safety and comfort of those concerned, would be justified as the minor evil. But, if it be true that the diffusion of epidemic disease is dependent in a great measure on atmospheric or general causes, apart from contagion, then the futility of quarantine is obvious.

The British and Indian Governments, basing their measures for prevention and protection on well ascertained facts alone, and not upon theories of etiology, have discontinued all quarantine measures, whether by land or sea, relying upon sanitation, combined with medical inspection, as the only and sufficient means of safety.

The British Government, represented by its Local Board, recognising the truly contagious nature of some diseases and its probability in others, has adopted measures of inspection and isolation of the sick, together with disinfection, and purification of ships, effects and persons, insisting at the same time on all that conduces to the

establishment of healthy conditions of living, but avoiding all undue interference with personal liberty. The following is an epitome of their measures as regards cholera:—

Ships known or suspected to have cholera on board, are to be detained by the Custom House Officers, until the Medical Officer of Health shall have inspected them.

Those on board suffering from cholera are, if possible, to be moved to a hospital, but if they remain on board they are to be isolated, and all that comes from them disinfected.

Those not suffering from cholera, but coming from an affected ship, are to be allowed to proceed to their destination, notice being given to the Health Officer of the district to which they go.

The ship itself and the effects of any on board, who have suffered from cholera, are to be disinfected and no further detention is to be imposed.

In India all quarantine, cordons and interference with personal liberty, including isolation of the sick, have been discarded as practically useless, attention being concentrated upon sanitary measures as the sole means of preventing the propagation and diffusion of the disease, as will be seen from the following summary of regulations for the army, which, as far as possible, are applied to the population generally.

In anticipation of an outbreak, personal cleanliness is especially enjoined, the utmost attention is to be given to the sanitary condition of the station, overcrowding is to be avoided and great care to be taken in watching and checking premonitory symptoms.

On the appearance of cholera, bodies of men are to be *at once removed from the affected locality;* great attention is to be paid to the purity of the water supply, and to the nature of the camping ground, and all dejecta are to be buried in trenches dug for the purpose.

Purification and fumigation are to be resorted to, both for the room or building in which any case of cholera has occurred, and for the effects of the sufferers.

Temporary buildings are to be erected as hospitals, but, in the case of the general population, removal of the sick from their homes is not enforced. It should be clearly pointed out that no danger is incurred by attending on the sick.

With reference to the futility of quarantine, Dr. Southwood Smith says, "the object of quarantine is to prevent

the introduction of epidemic disease from one country into another," and the whole machinery of it is based on the assumption that by an absolute interdiction of communication with the sick, or infected articles, the introduction of epidemic diseases into a country can be prevented.

This assumption however, overlooks the presence of an "epidemic atmosphere," without which it is now generally admitted that no disease will spread epidemically. "Allowing therefore to contagion all the influence which anyone supposes it to possess, and to quarantine all the control which it claims," there remains this primary and essential condition which it cannot reach.

Experience shews that "the influence of an epidemic atmosphere may exist over thousands of square miles, and yet affect only particular localities." The cases of cholera which have occurred in widely distant parts of England and Scotland, and notably in India, mark the presence of this influence; yet cholera has fixed itself and prevailed as an epidemic only in comparatively few places. Why has it so localized itself? Probably because it has there found certain local or personal conditions, or both. It follows that we should make diligent search for all localizing circumstances and remove them, "so as to render the locality untenantable for the epidemic." Quarantine however, leaves all these localizing conditions "untouched and unthought of."

"The question of contagion has no necessary connection with that of quarantine." The real question is, can it prevent the extension of epidemic diseases, whether contagious or not? "If it can it is valuable beyond price; if it cannot, it is a barbarous encumbrance, interrupting commerce, obstructing international intercourse, periling life and wasting public money." "Whether it can accomplish its object or not is a mere question of evidence," and everything in India and Britain affirms that it cannot do so.

With regard to the bearing of quarantine on the question of cholera, Professor Caldwell of America says: "Cholera, though a fatal scourge to the world, will, through the wise, beneficent dispensation under which we live, be productive of consequences favourable alike to science and humanity. Besides being instrumental in throwing much light on the practice of physic, it will prove highly influential in extinguishing the belief in pestilential contagion, and bringing into disrepute the quarantine establishments that have hitherto existed."

Measures of prevention and quarantine have been the subject of many international conferences; the following is a brief summary of the conclusions of those held at Constantinople in 1866, Vienna in 1874, and Rome in 1885:—

The theories on which the measures recommended by these conferences are grounded have undergone little change since the conference at Constantinople in 1866; the basis on which all the conclusions with regard to preventive measures are built up is still, as it was then, the theory of contagion.

Quarantine has, however, gradually been reduced from ten days imposed at the Constantinople conference, to seven days at Vienna, and to five days suggested at Rome, and even the five days are not to be exacted unless the ship has had cholera on board, or has been gravely suspected, after leaving port. But great stress is still laid on quarantine in the Red Sea, as though that were the channel by which cholera entered Europe, of which there is really no evidence.

Great modifications were suggested at Rome with regard to pilgrim traffic to Mecca, 10 days' detention in the Red Sea being reduced to 5, and 24 hours only being imposed on ships with a clean bill of health.

Land Quarantine was declared useless at the Vienna Conference, and both that and cordons were abolished at the Roman Conference last year, on the ground that they were impracticable.

It will be observed, that though the idea of contagion still prevails, it has undergone great modifications, suggesting the hope that the time may not be very far distant when reliance will no longer be placed on such barbarous institutions as quarantine, but upon sanitary measures which alone offer any guarantee for protection.

The question arises, what does it behove each individual of the community to do, as regards himself, his household, his village, town, and country, when cholera menaces, or has actually made its appearance?

Attention should be directed to careful living, careful clothing, and moderation in habits and diet. Avoid depressing influences, fear, over-fatigue, chills, violent alternations of temperature, aperient medicines, especially those of a saline nature, indigestible food, impure water, unripe or over-ripe fruit, and be careful to observe and promptly check any tendency to diarrhœa.

Pay due attention to ventilation, to perfect drainage, to purity of water-supply, to prevention of overcrowding, using all your personal influence to secure this throughout your village or town. Do not be afraid to attend upon the sick, for you will incur no danger thereby. Disinfection of excreta, effects, houses and rooms should be practised.

Protest against quarantine and all coercive measures which divert attention from the true sources of safety, summed up in the expression "complete sanitation."

There is good reason to believe that the measures recommended by our Government, if they are carried out by individuals and municipalities, are such as may imbue us with a feeling of confidence, that in the event of cholera appearing in this country, we shall be protected against any intensity of prevalence. The more we can perfect the measures now in force,—and you can do much towards this, for insanitary houses are still far too numerous everywhere —the more thoroughly we give them our individual and collective support, moral or material, the more complete we may anticipate, will be our immunity from the disease.

Experience on the Continent, during the recent epidemic, serves to show how futile coercive measures have been and must be, while the examples of Marseilles, Toulon, Valencia, Palermo, Naples, whose notoriously insanitary conditions have paid their natural penalty, will be, we may trust, a salutary warning as to how cholera may be intensified by local causes, and will give a lesson which, we hope, will not be disregarded.

We read in the *Times* of Monday, February the 22nd, that a most important memorial to the Lieutenant-Governor of Bengal, concerning sanitation is now before the Government of Bengal. This memorial states that since 1881, cholera has swept away more than 20,000 people in Calcutta and its suburbs; that in some suburban wards the death-rate has stood at 70 in the 1,000; that during the decade of 1875 to 1884, out of a population of 257,000 in the suburbs, no fewer than half have perished.

There is not the least doubt that the laws of sanitary science are thoroughly well understood in this country, and that the enactments of the Government would be most effective if properly carried out, but no Government can force good sanitation upon towns, villages, or houses, without the co-operation and hearty support of the resi-

dents, and all their measures will be found useless, unless backed up by the personal efforts and exertions of individuals. Experience shows us that in the present day the best houses are often most defective, and that local causes of disease, which might easily be removed, abound. Why spend £50 on hospitals for cholera, when £5 laid out on sanitary measures might obviate their necessity?

I do not wish to frighten you, but cholera is in Europe, and may appear wherever it can find a fitting nidus, that is, the presence of bad local conditions, and then all the quarantine and inspection in the world will not keep it out; that such bad local conditions in towns, streets and houses, are still the rule rather than the exception, is proved by the reports of the Sanitary Associations and of sanitary engineers who deal with these matters in localities where Government officials can exercise no interference. I regard this as a great sanitary defect of the present day, and I urge you to see to it thoroughly; for upon this may depend whether a pestilence which has already invaded Europe and is threatening us, shall find footing, or shall leave us unscathed.

The measures are simple enough if only the public can be brought to believe in the unseen but easily removable dangers within, around and beneath their houses.

I will conclude by quoting from the writings of Drs. Southwood Smith and Ferguson, which I strongly recommend to your attention.

Dr. Ferguson, speaking of epidemics generally, says:— "Places, not persons, comprehend the whole history, the etiology of the disease. *Places, not persons!* Let the emphatic words be dinned into the ears of the Lords of the Treasury, until they acquire the force of a creed which will save them hereafter from the absurdity of forcing quarantine. . . . . Let them further be repeated in the Schools of Medicine, until the Professors become ashamed of imbuing the minds of the young with prejudice and false belief, which, should they ever visit warmer climates, may cause them to be eminently mischievous in vexing the commerce, and deeply and injuriously agitating the public mind of whatever community may have received them."

Dr. Southwood Smith, writing on the same subject, says:—"Epidemics are under our own control; we may promote their spread, we may prevent it. We

may secure ourselves from them. We have done so We have banished the most formidable. Those that remain are not so difficult to be conquered as those that have been vanquished. . . . . We see that epidemics are not made by a divine law the necessary condition of a man's existence upon earth. The boon of life is not marred with this penalty. The great laws of nature, which are God's ordinances in their regular course and appointed operations, do form and give off around us, products which are injurious to us; but He has given us senses to perceive them, and reason to devise the means of avoiding them, and epidemics arise and spread because we will not regard the one nor use the other."

THE PROPAGATION OF CHOLERA

BY

HUMAN INTERCOURSE.

London:

H. Doughty, Printer, 219, Portobello Road,
Notting Hill.

THE outbreak of cholera in Egypt and the recent discussion, at the Epidemiological Society, on the sanitary lessons of Indian epidemics, have induced me to reprint, without note or comment, an article and a letter which appeared in the *Lahore Civil and Military Gazette* during the cholera epidemic of 1879, in the hope that light may be thrown on some of the many difficult questions, connected with the propagation of this mysterious disease.

J. B. SCRIVEN,

Late Civil Surgeon of Lahore.

95, OXFORD GARDENS,
NORTH KENSINGTON.

The "Extract" which is given on the opposite page is by Dr James Cunningham. The reply, which follows is by Dr Scriven.

Extract from the "Lahore Civil and Military Gazette," of July 1st, 1879.

THE present epidemic of cholera in Upper India and its supposed connection with the Hurdwar fair have naturally attracted much attention, not only in this country, but also in other parts of the world. Coincident with another large gathering, such as there was in 1867, cholera has again broken out in 1879, and, in the belief of many, has been diffused far and wide by the pilgrims. This diffusion by pilgrims has been telegraphed to the *Times* as if it were an established fact, and it has formed the subject of leading articles and letters in the Indian papers. People generally seem to have come to the conclusion, that if there had been no Hurdwar fair, there would have been no cholera, and that, therefore, it is incumbent on the Government to step in and absolutely prohibit fairs, which cause so much loss of life.

2. On every ground it is very desirable that the facts should be ascertained with as great exactness as possible. No interference with the religious prejudices and habits of the people could be justified except on the clearest evidence that such interference is really called for, and that it would lead to beneficial results. The whole world, moreover, is interested in learning the truth regarding a disease which is so much dreaded, and the ways of which are as yet so hard to understand.

3. But to be of any value the investigation must be conducted in a careful, and as far as means will allow, on an exact method. Loose statements or mere expressions of opinion, however decided they may be, will not aid in arriving at a just conclusion. The more carefully collected facts that can be got together the better. If every district in India from which people went to this great fair could furnish particulars of their number and history, both during their absence and after their return, and at the same time give a correct record of cholera cases among those who had not been to the fair, a vast body of evidence would be available from which much might be learned.

4. But it seems hopeless to obtain all this information. If asked for in a general circular, the importance of the subject would probably be lost sight of, and it might be looked on as a mere matter of routine. I would, therefore, suggest that a few

districts should be selected in each of the provinces of Upper India, and that the district officers in them should be asked to use their best endeavours to collect data under the following heads :—

(1) The approximate number of pilgrims that went from their district this year to Hurdwar fair.

(2) The time about which they left for Hurdwar.

(3) The number of them that died of cholera during all the time they were away, distinguishing, if possible, how many of these deaths occurred at Hurdwar itself, and how many at other places on the way back.

(4) The time about which they returned to the district from Hurdwar.

(5) The number that died of cholera after their return.

(6) The date of first case of cholera, and total number of cases among *them* after their return.

(7) Date of first case of cholera this year among the *residents* in the district, that is to say, among people who had not been to the fair.

(8) Total cases and deaths from cholera in the district since 1st January by weeks.

(9) Reasons, if any, for attributing the disease among the residents to the pilgrims. What connection, if any, was there between the pilgrims and residents attacked ?

5. It may not be possible fully to answer any one of these questions, which are given to indicate generally the heads under which data are desired. Where replies cannot be given for a district as a whole, they may perhaps be given for one or two of the principal towns. But it is most important that the facts should be thoroughly sifted, and that no evidence be accepted without careful inquiry. It is essential, moreover, that these facts should be kept quite distinct from any theories which are based on them.

6. The districts I would suggest are the following. They have been selected partly because of their geographical position, and partly because of the history of cholera in them during the current year, so far as this can be ascertained from the mortuary records :—

North-Western Provinces and Oudh.

Kumaun and Garhwal.	Meerut.
Terai.	Bulandshahr.
Bijnor.	Bareilly.
Saharanpur.	Moradabad.
Muzuffarnagar.	Lucknow.

Punjab.

Umballa.	Lahore.
Kurnal.	Amritsar.
Hissar.	Peshawur.
Sirsa.	Rawal Pindi.
Kangra.	Jhelum.

Central Provinces.

Jubbulpore.	Saugor.

7. I would also suggest that the Foreign Department be asked to collect similar information from the Native States of Central India and Rajputana and also from Baroda, from which I understand a considerable number of pilgrims went to the fair at Hurdwar.

8. To many persons such an inquiry as I have above recommended may seem altogether useless, and in fact, a mere waste of time. They are so thoroughly persuaded that the cholera was due to the pilgrims, and to the pilgrims alone, and that no further evidence is required. But as the inquiry, to be of any value, must be conducted without any preconceived basis, it will not be out of place to cite a few facts and considerations which throw grave doubt on the pilgrim doctrine, and render its acceptance by no means so ready or satisfactory a settlement of the question as has been supposed.

9. The first fact is, the very unequal incidence of the disease : some districts have suffered severely ; others lying close to them, and which probably sent just as many pilgrims to the fair, have escaped almost entirely.

10. In the second place, in some parts where the disease has been worst since the fair broke up, it had been present in a decided form before the fair took place. In Garhwal and Kumaun, for example, it was present for months before the fair.

11. Thirdly, the history of the disease, so far as can be gathered, is not that of a disease gradually affecting new centres and spreading from them, but of a disease which affected many centres within a very short period of time, and then instead of spreading, declined. In the Punjab, for example, between the 1st and 15th April, nine places returned deaths from cholera. Between the 16th and 21st the number rose to 39. From the 22nd to the 26th, it declined to 21 ; and during the last four days of the month it was only 10.

12. According to the mortuary returns, there has been no radiation of the epidemic from Hurdwar as a centre—no gradual diminution of its intensity in all directions, as the pilgrims, the supposed cause of its spread, became more widely dispersed, and

therefore less numerous in proportion to the general population. On the contrary, many of the places which have suffered most are the most distant from Hurdwar—as, for example, Peshawar, Afghanistan, and Sind.

13. The epidemic movement has been almost entirely in one direction,—*upwards;* and yet the pilgrims have moved in all directions.

14. Often pilgrims may have been the first attacked, and they may have suffered more than the general population. This can hardly be wondered at, considering the insanitary conditions to which they they are for the time subject, the fatigue, want of regular meals, dirt and overcrowding; but for all the reasons above given it seems not improbable that the pilgrims merely suffer from the same influence as is affecting the ordinary population, but that they are more susceptible to it, and therefore suffer sooner and more severely.

15. If the spread of a wide epidemic such as that of the current year, be dependent on pilgrims or other human intercourse, it is dependent on contagion, or in other words on accident, or rather on a vast series of accidents which occur in a year of cholera and do not occur in another year. The theory of accident seems altogether insufficient to account for such results.

16. Further, the similarity between the 1867 and 1879 cholera is most remarkable. It seems hardly conceivable that in these two years such vast results should be due to accidents, and that in both these accidents should be so arranged as to bring about such a remarkable similarity in these results.

17. In conclusion, it must be remembered, especially by those who advocate the prohibition of fairs as the best means of checking cholera, that although there has been the coincidence of a great epidemic conjoined with a great Hurdwar fair in 1867, and again the same coincidence in 1879, in the intervening years epidemics much more severe and widely spread than that of 1867 have occurred—as, for example, in 1869, when there was no cholera at the Hurdwar fair, and no connection could possibly be claimed between the epidemic and pilgrims. Fairs might be prohibited, though such a measure would be considered as a great hardship by the people; but to stop all the traffic of the country is simply impossible—and yet this is the measure which the acceptance of the human intercourse theory would demand.

18. On the other hand, the sanitary improvement of towns and villages—the provision of pure air, and pure water and good drainage, although difficult, and doubtless requiring time and education for its accomplishment—is by no means impossible.

J. M. CUNINGHAM,

Sanitary Commissioner to the Government of India.

The 12th June, 1879.

Extract from the same Paper, of July 11th, 1879.

LETTER TO THE EDITOR.

SIR,

An article appeared in your issue of July 1st, by Dr. Cuningham, Sanitary Commissioner to the Government of India, on the subject of the present epidemic of cholera, in which the question of its propagation by pilgrims from the Hurdwar fair is discussed. As Dr. Cuningham has heretofore been looked upon as the champion of a portion of the medical profession, who believe cholera to spread, not by human intercourse, but under certain atmospheric or other conditions which have not yet been fathomed, and which are, therefore, uncontrollable by human foresight, I cannot but rejoice to see, in the present communication a tendency to consider the question still *sub judice*, and a desire to set inquiries on foot, with the view of obtaining more exact knowledge on the subject.

2. Questions raised by so high an authority deserve the most careful consideration, and, as Lahore is one of the places at which he desires that these investigations should be made, I think it is well that I should take some notice of his paper. There are a few points, however, in which it appears to me that Dr. Cuningham's statement of the case is not altogether unbiased, viz.:—

First he speaks of only two epidemics, those of 1867 and 1879, which have had an obvious connexion with the Hurdwar fair, whereas there certainly have been three, for the cholera of 1872 was quite as clearly connected with the lesser gathering of that year as the epidemics of 1867 and 1879 with the greater ones.

Secondly, he speaks of "people generally," as having "come to the conclusion that, if there had been no Hurdwar fair, there would have been no cholera." Now this certainly does not represent the opinion of the medical profession generally; for a very large section of us, of which in this letter I claim to be the representative, hold no such view. We are content, for the present, to leave untouched the question of *de novo* production, and we look upon the Hurdwar fair simply as one of the means, by which the poison is reproduced multiplied and disseminated.

3. I now come to the inquiries which Dr. Cuningham desires to have made with reference to this so-called *pilgrim doctrine*. These are contained in his fourth paragraph; I prefer to take No. 8 first, and numbers 6 and 7 next.

Dr. Cuningham's eighth question runs as follows:

"Total cases and deaths from cholera in the district since 1st of January by weeks."

The returns by the Sanitary Commissioner of the Punjab show but one death, registered under the head of cholera, from January 1st to April 18th, in the Lahore district. This occurred during the week ending February 1st at a place called Moghul Serai, several miles from the station of Lahore where the first cases of the present epidemic were observed. It is more than probable that this isolated case was not one of true cholera, but even if it were a true case, the immunity of the whole district from January 1st to April 18th, with one single exception, is equivalent to a clean bill of health as regards this disease.

6. "The date of the first case of cholera, and the total cases among *them*, (pilgrims) after their return?"

7. "Date of first case of cholera this year among residents in the district, &c."

The first two cases of cholera were pilgrims from Hurdwar. They were admitted into the hospital at Lahore, on April 19th. At this time, the neighbourhood of the railway station was crowded with pilgrims, on their way to places above Lahore, and there were not trains enough to take them on. Many, of course, wandered into the city and bazaars, and the following day, April 20th, furnished three cases from among the residents of Lahore, who had not been to Hurdwar. The two pilgrims mentioned did not belong to this district, but were waiting for a train to take them northward. It appears to me, therefore, that the second clause of question No. 6, and questions Nos. 1, 2, 3, 4, and 5, become irrelevant, as they seem to have been propounded on the presumption that cholera, if spread by pilgrims at all, would be spread in each district only by those belonging to that district, whereas the facts are far otherwise.

9.—"Reasons, if any, for attributing the disease among the residents to the pilgrims, &c."?

My reasons are: first, that there was no cholera till the pilgrims came; secondly, the first cases were pilgrims; thirdly, though no immediate connection was proved between the pilgrims and the first three residents that fell sick on the 20th, the 21st furnished one case among the railway police, and the 22nd another among the railway porters who had been engaged in handling pilgrims' baggage.

4. Let us now examine the "facts and considerations," which in para. 8 of Dr. Cuningham's paper are said to "throw grave doubt on the pilgrim doctrine."

"The first fact is," says Dr. Cuningham in para. 9, "the very unequal incidence of the disease; some districts have suffered severely, others lying close to them, and which probably sent just as many pilgrims to the fair, have escaped almost entirely."

Surely this would apply to any mode in which an epidemic might arrive, the extent to which a place suffers being notoriously liable to great variation, depending on its sanitary state, the number of susceptible persons in it, and other conditions too subtle for analysis. A single case of cholera in one locality, and under certain circumstances, may light up an epidemic that will decimate the inhabitants, while in another place a dozen cases will fail to spread the disease at all. We cannot, therefore, look for any direct proportion between the number of pilgrims returning to any particular district, and the number of residents afterwards affected with cholera. In this paragraph it is easy to discern again Dr. Cuningham's idea that pilgrims can only spread the disease in their own district.

"In the second place" says Dr. C. in para. 10, "in some parts where the disease has been worst since the fair broke up, it had been present in a decided form before the fair took place. In Gurhwal and Kumaon, for example it was present for months before the fair."

This is in favour of the pilgrim theory, not against it, for Gurhwal and Kumaon were very probably in some degree the original foci of the disease, whence it was carried to Hurdwar, to be reproduced multiplied and disseminated.

"Thirdly the history of the disease" (para. 11), "so far as can be gathered, is not that of a disease gradually affecting new centres, and spreading from them, but of a disease, which affected many centres within a very short period of time, and then, instead of spreading declined."

This is also in favour of, not opposed to, the pilgrim theory; it is just what would be expected: when a vast number of cholera carriers were passing along the country, they would drop a few cases here and there within very short spaces of time, especially along the railway line, and the sequence of first cases at different places from Umballa to Lahore leaves no doubt whatever of the disease having travelled in this direction; while Dr. Fairweather's remarks on the mortuary return for the week ending April 19th, show conclusively that the pilgrims were the carriers.

The statement is not strictly correct that in all the infected localities, the disease *instead of spreading, declined*, for in some places in the Lahore district, it has spread to an appalling extent. This, however, as far as I can see, tells neither for nor against the pilgrim doctrine.

Para. 12 and 13.—"There has been no radiation of the epidemic from Hurdwar as a centre." "The epidemic movement has been almost entirely in one direction *upwards* and yet the pilgrims have moved in all directions."

We need not call the propagation and dissemination of a disease *radiation* unless we like—we cannot of course compare it

to the radiation of light from a centre, which would be equal in all directions. Nobody ever suggested, as far as I know, that epidemics would radiate equally in all directions, in fact, it is well known that as a rule they do not. Cholera for instance, over long distances, generally but not invariably, travels westward. This may perhaps be in part explained by the fact that its home and original starting point is the deltâ of the Ganges, from which the means of human communication are much more complete, and the traffic immensely greater, in the westerly than in any other direction; yet there are instances, even in the present epidemic, of its travelling in other directions, as for example southwards from Hurdwar to Meerut and Delhi; moreover Dr. Cuningham in para. 10, points out that in Garhwal and Kumaon, which lie to the east of Hurdwar, the epidemic has been very severe since the fair, although it was present there before: how then can he be certain that it was not carried back there from Hurdwar?

Para. 12.—"No gradual diminution of its intensity in all directions as the pilgrims became more widely dispersed . . . . . On the contrary, many of the places which have suffered most are the most distant from Hurdwar, as for example Peshawur, Afghanistan, and Sind."

Dr. Cuningham here throws doubt on the pilgrim doctrine because the intensity of the epidemic has not diminished with the distance from the centre. It would really *appear* that we are not to admit the dissemination of any epidemic by human intercourse, unless it follows strictly the laws of light and heat! But I am willing to believe that I have mistaken Dr. Cuningham's meaning, and would refer my readers to my remarks on the unequal distribution of cholera, at the commencement of this paragraph.

Para. 15—"If the spread of a wide epidemic be dependent on pilgrims it is dependent on contagion, or in other words on accident, or rather on a vast series of accidents," &c.

I fail to understand this; but if it be really true, let us substitute the word *contagion* for *accidents* in Dr. Cuningham's para. 16; we shall then read as follows; "it seems hardly conceivable that in these two years" (1867 and 1879) "such vast results should be due to *contagion*, and that in both this *contagion* should be so arranged as to bring about such a remarkable similarity in these results."

How, I would ask, can this be said to be hardly conceivable? On the contrary, it seems to me the very most likely thing to happen—given two similar gatherings of people at the same time of year, at the same place, under similar circumstances; what more probable than that the results would be strikingly similar?

Para. 17.—Epidemics much more severe and widely spread than that of 1867 have occurred when there was no cholera at the Hurdwar fair." "Fairs might be prohibited, but to stop all the traffic of the country is simply impossible, and yet this is the measure which the acceptance of the human intercourse theory would demand."

I have little to say on the first part of this paragraph as the fact of epidemics having occurred, independently of the Hurdwar fair, by no means disproves the possibility of their being sometimes dependent on it. But, to Dr. Cuningham's remark that the acceptance of the human intercourse theory would demand a stoppage of all the traffic of the country, I would reply that no sane member of the medical profession has ever, to my knowledge, made so extravagant a proposal. I am even opposed to quarantine, except in the case of public institutions, such as jails, lunatic asylums, &c. I do not deny that to stop all human intercourse would in all probability arrest the progress of cholera, but to stop human intercourse completely is impossible, and if it were possible, the remedy would be worse than the disease.

5. I will now state a few well established facts with reference to the spread of cholera.

(*1st*) It generally travels over long distances in the main lines of human communication; but it may deviate from these lines and attach itself to parties of persons travelling by the less frequented roads. This occured in 1872, when cholera was carried by a band of pilgrims returning from Hurdwar to Jummoo, not along the grand trunk road, but *viâ* Jagadri, Hooshyarpore, Goordaspore, and Sialkote.

(*2nd*). It never travels, over long distances, faster than men travel. This is universally true, whether its route be by rail or road, across a continent, or over the Atlantic Ocean. Putting this together with many other facts, such as those already treated of in this letter, we infer that human beings are the carriers. Hence, at Lahore, we find a great difference between the recent and the older epidemics, in the rapidity with which they reach us from below. Thus, in 1862, when there was no railway except from Umritsur to Lahore, the first cases were observed

At Kurnaul on	... ...	May 17th.
„ Loodianah on	... ...	„ 24th.
„ Ferozepore on	... ...	„ 24th.
„ Kussoor on	... ...	June 25th.
„ Lahore and Umritsur	...	July 22nd.

Whereas, this year 1879, the disease has travelled from Hurdwar to Lahore in a week from the 12th April, the great bathing day, immediately after which the dispersion begins, to the 19th.

(*3rd*). Over short distances, as between different localities of the same city, or from the city to the suburbs, it is probably sometimes carried by the wind, but more notably by the drinking water which frequently becomes contaminated with cholera excretions.

(*4th.*) Small streams such as canal cuttings are more readily contaminated than larger; but if a million of people bathe at one time in a river like the Ganges, many of them having the cholera poison about them, the great stream may be as much polluted as the small one, and as all the pilgrims drink the water while bathing, the poison is imbibed at once, and the conditions are most favorable for a reproduction of the disease in every susceptible individual. They then go to their homes, the susceptible persons fall sick after variable periods, and the cholera cases are dropped at different places on the railway line, having in many instances first communicated the disease to their fellow passengers in the closely packed railway carriages; others not susceptible themselves convey the poison in their clothes, and as pilgrims do not wash after leaving the Ganges, till they reach their homes,* the poison may, by that time, have attained a great development and activity, as will be explained in the next paragraph.

* See Report on the Sanitary Administration of the Punjab for 1872, Section II., para. 50.

6. The mischief done by the Hurdwar fair, therefore, may thus be summed up.

First, it gathers together persons from various infected localities, as well as healthy people from other places.

Secondly, the pilgrims from the infected localities bring the poison to Hurdwar, some convey it in their clothes, others in their bodies. In the clothes of such people it is subjected to filth, heat, and moisture, which are the circumstances most favorable for its activity and communicability to others. Those who have it in their bodies fall sick, and thus reproduce and multiply the contagion.

Thirdly, others imbibe the poison, either primarily from the clothes in which it has been brought, or from the bodies of the sick, or secondarily from their evacuations, and either through the medium of the air which is breathed, or the water which is drunk.

Lastly comes the dissemination of the disease over the country, in the way already described.

7. Finally, I cordially agree with Dr. Cuningham in his last paragraph, that even more important than the stoppage of the Hurdwar fair, is the sanitary improvement of towns and villages, and the provision of pure air, pure water and good drainage.

It may be impossible for Government to prohibit the Hurdwar fair; and even if it were prohibited, it is evident that we should not enjoy a complete immunity from cholera, as it sometimes occurs independently of any such assemblage. Seeing, then, that we cannot keep the enemy entirely at bay, let us be prepared, by the excellence of our local sanitation, to contend with him successfully when he assails our homes.

J. B. SCRIVEN,

Civil Surgeon.

LAHORE, 5th July, 1879.

National Association
For the Promotion of Social Science.

NORWICH CONGRESS, 1873.

PAPER ON CHOLERA,

READ BY

CHARLES SHRIMPTON, M.D.,

Tuesday, October 7th, 1873.

PRINTED AT THE "NEWS" OFFICE, LOWESTOFT.

internecine struggles of the mountaineers, but also against the regular

J. Graham Balfour Esq F.R.S
with kind regards

A PAPER Charles Shrimpton

ON

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National Association for the Promotion of Social Science.

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CHOLERA.

IT has been objected that Cholera, as a subject for a paper to be read before this Association, might be out of place; that it should rather be reserved for the discussion of medical men. In venturing to differ from this opinion, I would observe that on the discussion of Cholera hang other questions of the greatest importance—the value of quarantine laws, and of the sanitary measures employed as preventives of Cholera. These are matters which come under the control of the government, the special and local Boards, and on which medical men rarely have more than a consultative authority.

Cholera is inseparable from the question of contagion. The question then, whether Cholera is a contagious disease or not, is one of the highest general importance, and it cannot, I submit, be anywhere more advantageously discussed than in this section of the association.

The subject we have before us may perhaps be more profitably discussed by passing successively in review: the general abstract history of the propagation of Cholera: the principal features characteristic of the disease: the question of contagion or non-contagion: the efficacity of quarantine, of disinfectants, and of sanitary hygiene as preventive measures of Cholera.

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These are questions that cannot fully be answered in the short paper I have the honour to read. I will endeavour to condense the matter as much as I possibly can, and I must claim your indulgence for my shortcomings. I must plead also for indulgence if I should advance opinions not perhaps entirely in accordance with the highest authorities on such subjects.

General Abstract History of the Propagation of Cholera.

Cholera was formerly considered as a disease indigenous in India, and confined to the East. We find accounts of it from the earliest times in the Sanscrit writers, and in the Portuguese and Dutch writers of the seventeenth century, but we must refer to the British medical officers in India for the earliest accurate reports of the epidemics. The Company's possessions in India did not extend to any great part of the country till the end of the last and the beginning of this century. From this time British medical officers were in a better position to observe the nature of the disease, and the extent of the epidemics. All these reports, from the earliest periods, agree in their description of the disease and in the mode of outbreaks of the epidemics extending over immense areas widely separated from each other.

In 1817 the disease seemed to break its bounds; Cholera appeared for the first time in Malacca, Java, and Borneo: in 1819 it invaded the Birman and Chinese Empires: in 1821 Persia was invaded, extending to Arabia: in 1823 it invaded the shores of the Caspian Sea and part of Russia: in 1826 it made its appearance in Siberia: in 1830 Moscow and St. Petersburg had their visitations: in 1831 Poland, Galicia, Bohemia, Hungary, and Prussia were invaded: it appeared in England and in France in 1832.

We lately heard of Cholera at Vienna, in some parts of Galicia and Pesth: we hear of its "*breaking out*" in Turkey

at Rutshuck: in Germany at Danzig: in America at New York, Nashville, and Kentucky. From the medical periodicals of Berlin, August 16th, (quoted from the *British Medical Journal,)* we learn that there are cases at Königsburg, at Magdeburg, at Danzig, Munich, Wurtzburg, Dresden, Vienna, Pesth, Prague, Berlin, Braunsberg, Tiegenhof, Obersitzko, and in the report from the General Registrar Office, Somerset House, August 25th, the Registrar says, "To simple Cholera sixteen deaths were referred against sixteen and seventeen in the preceding weeks; eleven were of children under five years of age, and in each of the five adult cases the cause of death was certified as "*Choleraic Diarrhœa*."

We may observe in this rapid sketch of the propagation of Cholera a very remarkable uniformity in the invasion of the epidemics in every part of the world, appearing suddenly in different countries, invading at intervals of one, two, three, and four years, large geographical areas, without any transmission from one country to another.

The Principal Features Characteristic of the Disease.

The public is but too familiar with the principal features which characterise this terrible disease: the peculiar character of the intestinal evacuations: the profuse transudation from the cold, blue, flabby skin: the uncontrollable vomiting: the rapid emaciation of the body in the space of a few hours: the eyes sunken into their orbits: the cold breath and characteristic cold which pervades the whole body: the small feeble pulse: the broken voice and cramps form an assemblage of formidable symptoms which cannot be confounded with those of any other disease.

I venture to suggest that these, almost sudden changes, may be the effect of asphyxia affecting the elementary cells which compose the tissues of the whole body. If my suggestion should be confirmed, it will be easy to conceive that

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under such circumstances all the tissues of the body should be relaxed, allowing their serosity to exude from them, and thus account for the rapid emaciation, the sunken eyes, the small feeble pulse, the insatiable thirst. This exudation takes place principally through the walls of the intestinal canal and accumulates in the intestines. I wish particularly to call attention to this vast accumulation of serosity, and to the almost incessant evacuations constantly draining the whole system. The stomach and intestines are in a passive state, the power of absorption is suspended, and the evacuations are almost entirely composed of serosity in which float the epithelial cells detached from the lining mucous membrane. These evacuations have the appearance of "*rice-water*" from the quantity of epithelial cells contained in them. It is well known and accepted by everyone that these "rice-water" evacuations are one of the principal characteristic signs of Cholera. They are also characteristic of what is called Cholerine. Cholerine is nothing less than Cholera itself in its mildest form, and is most insidious in its invasion. The patient, though he may have been affected several days, is rarely sensible of the dangerous nature of the disease, and is naturally led to believe that "it is only a little diarrhœa," until suddenly it breaks out in all its violence. Care should then be taken to make a broad distinction between two affections so widely different, and even opposed to each other in their nature and in their consequences, as diarrhœa and cholera. We call attention to the Registrar's remark that such cases are "*certified*" as "Choleraic diarrhœa," which is a proof that even medical men do not always make a distinction between these two affections.

The state of asphyxia, of which I have just made mention, affects the whole frame; all the secretions are suspended, there is no urine, no bile, no gastric juice, no saliva, no lacrymal secretion.

The vital action of the lungs is also suspended, and respiration is reduced to the mere mechanical action of the entrance and exit of air from the lungs, as from a dead

body. The air expired is four or five degrees below the surrounding atmosphere. The blood is no longer converted from the black venous to red arterial blood. The whole body becomes blue, cyanosed. This has always been described as *the period* of asphyxia; it is nothing more, however, than the more marked symptoms of Cholera in *all* its periods—I claim asphyxia as the character of Cholera affecting the elementary cells of the whole system during all the periods of the disease, from Cholerine to this cyanosed state; it is only a difference of degree. A patient need not necessarily pass through any of these periods, from one to another; he may be struck at once with Cholera in its most violent form, or simply with Cholerine.

Another remarkable feature of Cholera is the reaction, *the return of animal heat after death.* The body of the patient in whom no reaction could be obtained during life becomes gradually warmer after death, and the body retains this warmth during two or three hours. This return of animal heat after death struck me with amazement. I naturally asked myself how this could be? I account for it in this way: that though organic life has ceased, the elementary cells, which compose these organs, retain the individual, special vitality with which they are endowed, and, as soon as the choleraic influence ceases, the temporary reaction takes place. This theory seems to be confirmed by the fact that, by its light all the symptoms of Cholera and all the pathological changes appear to be explained. May not this asphyxia of the elementary cells be occasioned by electricity from a combined telluric and atmospheric action? The action of electricity appears to be the only means by which we can account for the symptoms and pathological changes in Cholera. Does it not also appear that Cholera, like a cloud, casts its influence over an immense area, and like the discharge of atmospheric electricity, strikes here and there at the most distant points of the invaded area?

The Question of Contagion or Non-Contagion.

This is undoubtedly one of the questions most important in all its social, commercial, and international bearings that can be brought before this section of the association. Cholera has occupied the most scientific men more than any other disease, and yet the question of contagion of this disease remains undecided.

We formerly considered Cholera as a disease confined to India, and watched it in security from a distance. Very few persons at that time considered it to be a contagious disease, and indeed this was the prevalent opinion in India. In confirmation of this statement I beg leave to refer to some of our best Indian medical authorities on the subject. In his excellent work on the influence of tropical climates, Sir Ranald Martin says, under the head of "Epidemic Cholera:"

"I shall now lay before the reader, in as condensed a form as possible, the results of inquiry instituted by order of the government and the medical authorities of Bengal, Madras, and Bombay, with a view to obtain the best possible information as to the history, nature, and cure of Epidemic Cholera."

After giving extracts from these reports from 1774 to 1814, Sir Ranald continues, page 513:—

"Without disputing the possibility of contagion in Cholera even in the midst of, and notwithstanding the thorough ventilation prevalent throughout India, I am bound to say that although I may be said to have lived in the midst of the disease during many years, I have never seen anything which in my opinion warranted the belief, nor have I ever communicated with any Indian medical officer who believed in the contagiousness of Epidemic Cholera in India."

Mr. Twining, First Assistant Surgeon General Hospital, Calcutta, in his "Clinical Illustrations," says, page 181, Vol. II.:—

"If the disease were contagious, the persons most exposed to contract Cholera in the General Hospital of Calcutta would be those having charge of the bedding and clothing, and those employed in personal attendance on the patients."

He states that during a period of twenty-five years neither the washermen, the native dressers, nor any of the servants in the hospital were attacked with Cholera.

Mr. Annesly, Garrison Surgeon, Madras Medical Establishment, after stating many facts and citing the able report of Mr. Jamieson in support of his conviction of the non-contagion of Cholera, in his "Sketches of the most Prevalent Diseases of India, comprising a Treatise on the Epidemic Cholera of the East," says, page 212:—

"In illustration of the above statements, I may adduce what occurred in the Hospital under my charge. Indeed in the Hospital, and during the course of my whole experience of the disease elsewhere, no more than two cases occurred to me which the most strenuous supporters of contagion in this disease could adduce in aid of their views, and these cases evidently appear to have arisen from a very different source than from contagion."

During the epidemic of 1832 in Paris, upwards of 2000 persons were employed in the hospitals, of whom 164 were attacked with Cholera; of 58 persons employed in the Hospital of St. Petersburg only one succumbed; of 123 persons employed in one Hospital at Moscow only 2; and of 253 persons connected with another Hospital only 4 were attacked with Cholera. Assuredly then since the attendants on the sick suffered less from the epidemic than the general population, there could be no contagion.

Though the people in Paris were terrified, bewildered, and were carried away by the most extravagant illusions, accusing the government at one moment of having poisoned the water, at another time the wine, there was no thought of contagion. Monsieur Gendrin, one of the Physicians of the Hotel Dieu, in his "Monographie du Choléra," says that the patients who were brought to the Hospital

came from different parts of Paris, and that their occupations were so different it was impossible they could have contracted the disease from each other.

I was Chirurgien sous aide Major at the Military Hospital, Gros Caillon in Paris, and was attached to the service of the Cholera wards during the epidemic of 1832, and can affirm that the idea of contagion was never entertained by either the military medical officers or the patients during the epidemic.

Cases without number might be adduced in support of the non-contagion of Cholera, but contagionists bring forward quite as many in support of their conviction.

In 1836 the tide of opinion changed in favour of contagion. The people were panic stricken; we heard that at Naples physicians traversed the streets covered from head to foot with sacks of waxed cloth, into which two pieces of glass were inserted to admit light. We heard of whole populations flying from their homes, abandoning the sick and dying. Contagion is always accompanied by fear—a most selfish and persuasive adviser.

Can it be wise to submit to frantic fear? We know that fear is one of the most frequent causes of Cholera in times of epidemic. Our first duty under such circumstances must be to support the moral courage of the people, carefully avoiding everything that may legitimise their fear. Do not Quarantines, Lazarettos, Sanitary cordons, &c., legitimise this fear, and are we justified in admitting that Cholera is a contagious disease? If Cholera were a contagious disease, all discussion would have ceased long since. Has the contagiousness of the Plague, of Typhus, of Small-pox, of Scarlatina, etc., ever been contested?

We know that the effluvia from bad sewers, the use of impure water, overcrowding, the neglect of hygienic measures, will produce Typhus and Typhoid fever, and that the specific contagium will produce Scarlatina, Small-pox, Measles, etc. The neglect of hygienic measures, etc., can be only *auxiliary*, by no means the *cause* of Cholera; and as for the specific poison or contagium, the most scientific

and skilful men have searched in vain for this specific poison during the last forty years. We may then, I submit, conclude that there is no poison to be found. This is the great difficulty the contagionists have to contend with. By the assertion that Cholera is a contagious disease they are driven to the necessity of discovering the means by which it could be transmitted. Specific poison, microzooaires, microphytes, disease germs, even the excreta of Cholera patients, have, each in their turn, been accused. Admitting that Cholera could be produced by any such means, assuredly none of them could account for the sudden appearance of the disease in countries and places so widely separated from each other as we see at this moment in Europe and America.

Contagion is, however, become law, and law from the highest authority. The conference of Constantinople in 1866, composed of delegates from all the states of Europe, have decided the question. The "Exposé de la Conférence Sanitaire de Constantinople" by Dr. Fauvel, one of the delegates from the French Government and "Rapporteur Général," of the Conférence, is a complete resumé of all their labours. This work of 664 pages, containing all the conclusions and instructions of the Conference, declares Cholera to be a contagious disease, and enjoins all the old routine of disinfectants, quarantine, etc., though by their own admission they did not know by what means the disease is produced. This is distinctly stated in page 15 of Dr. Fauvel's work,—

"It is easy to understand what an important discovery it would have been if we could have found, in these foci (in India) the special cause to which we might attribute with probability the endemicity of Cholera. Unhappily the Conference has not been able to come to any other than a negative result. None of the suppositions, neither the alluvial deposits of the Ganges, nor the custom of casting the bodies of the dead into the sacred river, nor the ruin of the great hydraulic works for the reserve and the distribution of water, nor the state of the soil, nor the climate, neither the habits nor the food of the

people, nothing, in a word, of all these supposed causes has withstood the test of a serious examination."

This paragraph refers to India, but the "cause speciale du Cholera" has never yet I believe been discovered there or elsewhere.

I must refer once more to the "Exposé de la Conférence," for I find it stated, page 285, that the ship named "Le Stella" is accused of having landed two Cholera patients at Marseilles on June 11th, 1865, and of having thus brought the Cholera from Alexandria to France. This does not appear to be a correct statement. We learn from the official report of Dr. Didiot, Medécin Principal des Hôpitaux Militairis, residing at Marseilles, that there had been two cases of Cholera at Marseilles, one on the sixth, the other on the ninth of June. The first recovered, the second died. The "Stella" did not reach Marseilles till the 11th of June, and none of the passengers on board had had Cholera. Evidently the conference took their data from a report of Dr. Grimaud de Caux which, as I have just shown, was officially contradicted by Monsieur Didiot. I cite this fact merely to show how we are sometimes deceived, and it is very unfortunate on this occasion, as it is on the epidemic of 1865 that all the arguments and convictions of the Conference are based.

Would it not be advisable before we proceed any further to inquire if Cholera could be a contagious disease, i.e., if we find in Cholera the conditions necessary to give it this character? All contagious diseases have necessarily a period of incubation—a period during which the materies morbi is taken into the system, assimilated and elaborated. In the first place we have failed hitherto to discover this materies morbi, and in the second place the process of incubation is one of vital action inducing fever. Do we at any time from the moment a patient is attacked with Cholera to the period of reaction, during the whole course of the disease, find anything like febrile action in Cholera? Is not the patient, on the contrary, thrown into a state of prostration, more or

less marked, according to the degree or period of the disease, from Cholerine to Algide Cholera? The vital powers are, I submit, more or less suspended, all the functions are paralysed by this state of asphyxia. There cannot be any absorption of the materies morbi, there cannot be any assimilation or elaboration of infecting matter as we find in all contagious diseases.

I am very sorry all my arguments should tend to prove that Cholera is not a contagious disease. It would be much more satisfactory to prove the contrary, for if Cholera were a contagious disease we should have a certain control over it, and not be fighting against an unknown enemy.

The Efficacity of Quarantine, of Disinfectants, and of Sanitary Hygiene as Preventives of Cholera.

We seem to fly almost instinctively to quarantine for protection when we are threatened with the invasion of a disease of any kind. But is quarantine really effective in protecting us from the invasion of Cholera? I should certainly say it is not. We have only to look around us, to cast an eye on the map when we hear of an outbreak of Cholera, to feel that there must be some cause hitherto unknown and quite of a different character from that which occasions the outbreak of other diseases. Cholera is not stayed by mountains, rivers, or oceans. Can it then be controlled by quarantine? Did the most rigorous measures of quarantine prevent the appearance of Cholera in London, in St. Petersburg, in Spain in 1832, and in Naples in 1836? Of what avail can quarantine be at this moment when Cholera has broken out in almost every country of Europe and in America? Quarantines, Lazarettos, and Sanitary cordons must be admitted to be the remains of a barbarous age interrupting commerce and legitimising fear among the people. They by no means protect us even from contagious

internecine struggles of the mountaineers, but also against the regular

diseases. What security can they then give us against the invasion of a disease which is propagated in some way hitherto unknown and mysterious to us?

Did the most rigorous quarantine laws conjointly with the absolute seclusion of all persons affected with the Plague, and of all persons who had been in contact with them, prevent the Plague from committing the most fearful ravages in London, and visiting us with an epidemic every twenty or thirty years? The quarantine was itself a focus of infection, and served in every way to add to the horrors of the visitation. Nothing less than the fire of 1666 burning down, we are told, 400 streets in which were 13,000 woolen houses, each one of them a focus of infection, could have stayed the Plague in London. The whole place had to be cleared. If the fire had not providentially swept away all these foci of infection, when would it have been done? Would it ever have been done? The Plague would certainly have continued its ravages, but since the fire we have never had any return of the Plague, though certainly cases have been imported more frequently than they were 200 years ago. We may learn from this, I think, that we can never make too great a sacrifice in destroying the foci of infection as our *only* security against epidemics of contagious diseases. Is there not then something really empirical and barbarous in the institution of quarantine?

We know whence come the Plague, Typhus and Typhoid fever. We can effectually secure ourselves against the invasion of these diseases. Can we secure ourselves against the invasion of Cholera? We could most assuredly do so if we knew the focus from which it came, and the means by which it is propagated. We certainly do not obtain any security, nor do we advance our knowledge of the disease by declaring that Cholera is contagious.

Can we find any security in disinfectants as a preventive measure? We must ask ourselves what it is that we have to disinfect to prevent Cholera? What is it? Where is it to be found? No one yet has been able to tell us. Is it not then somewhat of an empirical operation to set about decomposing and neutralising this and that liquid without knowing what it is we have specially to decompose and neutralise?

But should we rely on disinfectants as preventives of diseases known to be contagious, except perhaps as a purely temporary measure? It would be better assuredly that they should not be relied on, for by having recourse to them we deceive ourselves, and make believe that we are doing something when in reality we are effecting nothing at all. By disinfectants, it is true, we destroy effluvia as they arise, but they will always arise and continue to do so until we have destroyed the source from which they come. Disinfectants moreover are always more or less noxious in themselves, charging the atmosphere with vapours which cannot improve the quality of the air we breathe. In fact by using disinfectants as preventives of Cholera, we are certainly doing harm without even the probability of doing any good.

I submit, then, that quarantine and disinfectants, as preventives of Cholera, are absolutely inefficacious, illusory, and injurious; and that by the strict observance of Sanitary Hygiene, quarantine and disinfectants must become superfluous.

The rapid sketch I have endeavoured to give of the history of the propagation of Cholera, and of the principal features characteristic of the disease, may, I trust, suffice to show that our researches must have quite a different direction to enable us to discover the agent to which we must attribute the disease itself, and the means by which its epidemics break out so mysteriously amongst us. I shall consider myself extremely fortunate if I may in any way have contributed to the discovery of the agent capable of producing such terrible effects. This agent will most probably be found to be electricity in some special action between the atmosphere and the earth. This I frankly admit is simply an hypothesis, but it is the only theory which can, I believe, account for the disease itself, and for all the circumstances accompanying it.

My conclusions are:—

First—That the cause, or origin of Cholera, may probably

be the effect of a combined electric action of the earth and the atmosphere under some peculiar circumstances hitherto unknown.

Secondly—That Cholera is a state of Asphyxia of the elementary cells of the whole system, and cannot be a contagious disease.

Thirdly—That we derive no protection whatever from Quarantine laws, Lazarettos, Sanitary cordons, and disinfectants against Cholera.

Fourthly—That the execution of Sanitary measures will always protect us from contagious diseases, and in a certain measure from Cholera.

I have not discussed the question of the treatment of Cholera because this is a purely medical question, and is simply the practical application of inductive reasoning on the nature of the disease, the condition in which the patient may be, etc. It will be evident, however, from the paper I have had the honour of reading that the principle by which I have always been guided, and by which, I believe, all medical men are guided, is based on the efforts to obtain reaction.

CHARLES SHRIMPTON, M.D.

5, *Whitehall, S.W.*
September 6th, 1873.

With the Author's Compliments

[Reprinted for the author from the BRITISH MEDICAL JOURNAL, Dec. 27th, 1884.]

REMARKS ON THE THERAPEUTIC ACTION OF THE ACONITUM FEROX, OR INDIAN ACONITE.

Read in the Section of Pharmacology and Therapeutics at the Fifty-Second Annual Meeting of the British Medical Association.

By D. H. CULLIMORE, M.D., M.R.C.P.Lond. and Dubl., F.R.C.S.
Late Senior Physician to the North-West London Hospital; Retired Surgeon, Indian Army.

BESIDES the aconitum napellus, with the efficacy of which as a vascular sedative and antipyretic, owing to the initiation of Fleming and the persistent teachings of Ringer, all are familiar, we have, addition, the following species of this drug;

1. The Aconitum paniculatum, which is devoid of pungency;
2. The Aconitum Fisheri, or Japanese aconite, which deserves investigation, as it is said to be largely used in England under the name of the aconitum napellus;
3. The Aconitum ferox, and the A. heterophyllum; also other species.

It is to the aconitum ferox, from which much of the aconitia sold in this country is obtained, that I purpose mainly to direct attention, allowing myself but a few words descriptive of the Aconitum heterophyllum, also of Indian origin.

I will first give you a brief history of this drug, and then detail the results of its administration in cases in which I have been able to watch its effects, with the hope that the attention of others more capable may be directed to its fuller investigation.

The aconitum ferox seu virosum is, as its name indicates, the most powerful and deadly of all the species of aconitia, as well as the most familiar among the poisonous plants called bikh, or bish. So much so is this, that the word bikh, which literally means a poison, has come, also, to be the vernacular application of the Aconitum ferox. This plant was first identified and described by Wallich in his *Plantæ Asiaticæ Rariores*. It is a native of the Himalaya Mountains, Sirmon Kumaon, and Nepaul, and one of the most celebrated articles in Indian medicine and toxicology. It is generally found at an elevation of from 10,000 to 14,000 feet; its presence being stated, on good authority, to indicate that the fever-range is passed. This fact, might possibly suggest its use in malarial fevers. The root is highly poisonous, both internally and when applied to wounds; and its action in this latter respect, when in a concentrated form and fresh, is dangerous in the extreme. A preparation of the root is much used in the hilly districts to poison arrows, for the destruction of wild beasts and tigers, which are often destroyed in this manner when approaching and leaving their watering places. In former times, also, these poisoned arrows were often directed against higher game than tigers, not only during the internecine struggles of the mountaineers, but also against the regular

troops of the East India Company. Thus, many years ago, Dr. Berry White, who may still be seen at the meetings of the Epidemiological Society, when in charge of a party of Sepoys, during an engagement with the Abors or Padams, heroically sucked a wound, and suffered distinctly from the action of the poison on his tongue. These Abors inhabit the hilly country bordering on Thibet, to the north of the valley of the Bramapootra river.

The poison is here called bees, as it is in Assam, and is, no doubt, identical with the Bengali bish, the Hindoo rish, or bikh, the Sanscrit visha, the Mahratta wachnack, all of which are but different names of the same poison, and the product of the same, or allied, species of the aconitum ferox, as the A. luridum palmatum, etc. It has also been used to poison wells on the approach of an enemy.

The aconitum also, in some form, has been known, from time immemorial, as a poison in England; and there is an inscription on the tomb of a bishop, or high dignitary, in York Cathedral, which states that he was poisoned with aconite. The name of aconite is probably derived from the Greek ἀκόνιτον, mentioned by Theophrastus as a virulent poison.

Description of Plant.—The tubers are two to three, fasciculate and fusiform two to four inches long, blackish externally, and pale inside. The stems are each two to three feet high, smooth at the base, slightly downy upwards; the branches are villous; the leaves roundish, heart-shaped, deeply five-parted; the lobes are incised, wedge-shaped at the base, generally hairy along the veins on the lower side.

The root, which is the part generally used, is brittle, breaks with a resinous fracture, and is readily reduced to a coarse powder. In this state it has no smell, and is slightly bitter to the taste, followed by a benumbing of the tongue. When treated with ammonia, the watery solution yields aconitina. After boiling with alcohol, and subsequent spontaneous evaporation, 1,000 parts yield to water 280, to alcohol 360. Such is the history and character of the drug, to the effects of which I will now draw attention.

The preparation which I used was the tincture, in the proportion of one part of the root to ten of proof-spirit. This was made, at the suggestion of Dr. Murrell, by Mr. Martindale of London.

1. I made the first trial on myself, having first ascertained the state of the pulse, etc.

On July 1st, the tongue was moist, and red at the tip and edges. Pulse 78, with fairly strong beat, and regular. Temperature in the mouth, 97.5°; in the groin, 97.4°; in the axilla, 97.4°; in the rectum, 98.4°. The urine in twenty-four hours amounted to 36 ounces and 4 drachms. On July 7th, at 5 P.M., I took three minims of the tincture of aconitum ferox every half-hour till sixteen minims were taken. No effect followed till nine minims were taken, when there commenced a slight sensation of agreeable heat in the stomach and limbs, followed, on increasing the dose, by a feeling of quietude and relaxation, and, still later on, by the very slightest tingling of the lips and mouth, which soon passed away. The pulse fell to 70. The pupils seemed slightly dilated. On awaking after a good night, there was a little lassitude, which soon passed away. The urine passed was forty ounces, against thirty-six when the drug was not given. The temperature in the rectum fell half a degree; it was not altered elsewhere. Though conducive to sleep, the aconite had no direct soporific or stupefying influence. On another occasion, I took twelve drops without any perceptible effect.

2. I gave to a full grown cat, of moderate size, ten minims diluted with a little milk, by injection into the mouth. This dose had no visible effect for at least twenty minutes, after which the animal commenced to hiccough and feel restless. In ten minutes more, she seemed all right again. The administration of an additional fifteen minims was followed by hiccough, roughing and standing up of the

hair on the neck, frothing at the mouth, with a desire to avoid the light and cover herself up. The gait was unsteady, the hind feet being slowly drawn up. The pupils were dilated. Evidently there was slight convulsion, a kind of shriek or cry, followed at once by vomiting. This did not occur for an hour and a half after the first administration. The vomiting was repeated several times; the vomited matter consisted of clear fluid, like whey, mixed with stringy mucus. After this, she lay quiet, was not again disturbed, and was all right next day.

3. I gave ten drops in milk to a dog weighing 10½ lbs. It had, after half an hour, no visible effect beyond that of making him more restless than usual. Twenty minutes after a second dose of ten minims, he began to feel uncomfortable, and to appear conscious that all was not right. He frequently lay down, and got up again, and seemed unsteady on his legs, and, after a little, looked very miserable indeed. Soon after this a convulsive twitching about the neck commenced, as if he wanted to get rid of something about the throat. He did not avoid the light. After about two hours, he also vomited, and passed urine frequently. In a few hours, he had recovered, with the exception of hoarseness and throat-cough, which continued for about ten days. The mind was in no way drowsy; and the animal seemed clearly to feel his ailing condition, and looked grateful for kindness shown him.

4. A very delicate, nervous lady, aged 30, of rheumatic taint, was attacked with neuralgia. Her pulse was 100; temperature normal. One tooth was slightly decayed. I gave her half a minim every ten minutes till eight were taken. The medicine finally relieved the pain; a good night followed, attended, however, with dreams. The drug reduced the pulse ten beats in the minute; and, on awaking in the morning, she complained of a feeling of lassitude, very slight, and numbness in the hands and feet, which passed away when she got out of bed. This lady occasionally suffers from numbness without the aid of any medicine; it is therefore difficult to say how far it was due to the medicine on this occasion.

5. A strong female, with a pulse of 70, had painful neuralgia. One drop of the tincture was given every hour till ten were taken. This gave relief, which was followed, about 1 A.M., by sleep till morning. It had no other effect. In none of those cases was there any perspiration whatever.

6. This was a case of sick headache in a young married lady of nervous temperament, with a weak heart. She had violent headache, with delirium, great heat, and throbbing of the temples, with nausea and vomiting. Six minims given in one hour had no effect; twenty grains of bromide of potassium gave ease; and a second dose was followed by sleep. This is contrary to the opinion of Ringer as regards the Aconitum napellus, which he praises highly in sick headache.

7. This was a case of neuralgia in a gentleman, involving the two lower divisions of the fifth nerve; the teeth were not diseased. He had rheumatic pains in other parts. One drop given every ten minutes till ten were taken gave relief and sleep. It caused no perspiration nor reduction of pulse, or numbness. He thought, however, that it excited the generative organs.

8. A child, aged 8, had scarlatina, with slight sore-throat. It was the second attack, and followed a burn; the eruption was somewhat unusual; temperature 102°. Two minims were given every fifteen minutes for an hour and a half, when the temperature was found to be 103°. The patient was then taken home, and one drop ordered every four hours during the day. Towards night, the mother informed me afterwards, perspiration followed by coolness ensued; after which he soon became convalescent. This case shows that, though the antipyretic action be delayed in cases of fever, it is not lost.

9. A female, aged 19, complained for six weeks of pain over the hepatic region and loins. There was occasional albuminuria. The

pain, though rarely absent, was subject to frequent exacerbations. The temperature, which in the axilla was normal, reached 100° when taken in a pinched up fold of skin over the liver. I gave her eight drops of the tincture in drop-doses every ten minutes. At the end of the time, the pain was relieved, and the temperature reduced to 99°. I ordered her to continue one drop three times a day. At the end of a week, the pain continued, though the temperature stood at 99°.

10. A female, aged 45, had severe spasmodic asthma with distressing exacerbations. Tincture of aconite in drop-doses, given every ten minutes for two hours, gave no relief during an exacerbation. This drug was also continued every four hours for a fortnight in drop-doses. It did no good. Much relief was experienced from amyl-nitrate, and some also from nitro-glycerine. The heart was sound.

11. This was a case of aortic regurgitation, with slight albuminuria. The tincture of aconite was given in one-drop doses three times daily for six weeks. In this case, the cardiac action was quieted, and the murmur became almost inaudible, while the albumen disappeared; but whether these were due to the drug, or to rest in bed and good diet, I cannot say.

12. In a case of acute nephritis following lardaceous disease, with suppuration of the hip-joint, tincture of aconitum ferox was given in one-drop doses three times daily. After six weeks, though the urine greatly increased, and the quantity of albumen became less, both it and the blood still remained. As in the other case, rest and diet, and local application, may have assisted in the benefit which took place.

13. A case of tubercular leprosy, in an European boy from India, was kindly placed under my care by Dr. Colcott Fox. After a fair trial of the aconite, Mr. Dendy, the house-surgeon, writes me as follows, of the last two cases as well as this. "This is the only case in which I think anything definite can be said, as all other treatment was stopped, and he certainly seemed to improve in the face." In this case, the elevated copper-coloured blotches, characteristic of the hopeless stage of the malady, were well marked, and any drug that seems to improve or even check their progress is worthy of trial.

Besides the above, I have also tried this drug, both externally and internally, in some cases of acute gout, with the best results.

As an external application, it is, I think, distinctly superior to the aconite liniment of the *British Pharmacopœia*, and the following lotion I have found to give better results than the tincture of the aconitum ferox or other preparation. ℞ Aconitinæ gr. j; spiritûs rectificati ℥j; glycerine ℥iv; aquæ ℥j. Fiat lotio. To be applied over the painful part.

Such are the cases where I have been able to try this drug. They are not, perhaps, very interesting in themselves; but if they serve to direct further attention to this subject, particularly among European practitioners in India, my object will have been attained; for the adoption of such a course will both save expense and benefit science. As to the mode of action of the drug, it is, I think, similar to that of the aconitum napellus. The difference is more of degree than of kind.

Thus, it is more diuretic and less diaphoretic than the aconitum napellus; and probably, also, because it is less diaphoretic it is less antipyretic.

As an anæsthetic, or dysæsthetic, in gouty and rheumatic conditions, it is superior to the aconitum napellus, while, as a vascular depressant, in small doses it is not so powerful. I have given it in a case of fatty heart and intermittent pulse during an attack of intercurrent congestion of the lung in an old subject, not only without danger, but with a highly beneficial effect. In this case, it quickened the heart's action. In minute doses, it probably acts as a cardiac stimulant. In small doses, it stimulates the nervous system at all parts,

and peripherally. In moderate doses it causes dysæsthesia, perversion of sensation, as exemplified by the tingling and numbness; while, in larger doses, it is an anæsthetic, and a paralyser of the nerves and other centres. Its first action on the nervous system, with its diaphoretic effect, will probably be found to explain its good effect in leprosy.

Its first effect is to produce heat, followed by lowering of the temperature and cold perspiration. The heat-producing effect I felt myself, though the heat of bed may have prevented the subsequent coldness and perspiration. Also in the case of scarlatina above detailed, the primary exaltation of temperature, followed by coldness and sweating, was well marked.

Its antipyretic effect is due to a lowering of the central circulation, by which it lessens the production of heat, while, by its diaphoretic action, it facilitates its removal. Thus its action is different from that of quinia and some other drugs, which destroy or minimise, by their antiseptic action, the conditions which lead to, or tend to excite, fever. When given in chronic rheumatic conditions, it may be given till tingling is produced; whereas, in acute rheumatism, its action on the heart, though useful in moderate doses in the early stages, and in small throughout, must be carefully noted later on in this disease.

In still larger doses, it causes nausea and vomiting, muscular tremors of the limbs, profuse cold sweats, disappearance of the painful peripheral sensations, dryness of the throat and fauces, ardent thirst, alternations of heat and cold, great irregularity of the heart's action and of respiration, feebleness, and even loss of muscular power, great and burning heat of the stomach, throat, and intestines, attended with some muscular cramp, extending to nails, lips, and heart. This, if life be prolonged, is followed by inflammation, convulsions, intoxication, delirium, and death, which is sometimes attended with stupor, though, at others, the mind remains clear to the last.

One word, in conclusion, as regards the aconitum heterophyllum, known in India, under the name of atees, as a powerful tonic and aphrodisiac medicine. It possesses none of the poisonous, antipyretic, or anodyne properties of the other species of aconite. Sixty grains were given to a large dog without any injurious effect. As a tonic it is useful; while, as an aphrodisiac, I have no personal experience; but as I know that the late King of Burmah, who kept seventy wives, and whose opinion, therefore, is deserving of respect, held it in high esteem, it is probable it may possess some virtue in this direction.

Professor Matthew Hay (Aberdeen) said that the members were greatly indebted to Dr. Cullimore for his varied observations on the effects and uses of Aconitum ferox. It was greatly desirable that other physicians placed in our colonies would devote similar attention to other drugs which might be found in use amongst the natives. America had done much recently, first, through its eclectic practitioners; and, latterly, through its regular physicians, and largely also its chemists, to bring to the notice of the medical profession throughout the world, the virtues of their indigenous drugs. Similar work was urgently called for in our colonies and possessions, especially in India and Australia; and there could be no doubt that equally good results would be obtained.

THE

NATURE AND TREATMENT

OF

BLACKWATER FEVER

WITH

BIBLIOGRAPHY, NOTES AND TEMPERATURE CHARTS OF CASES TREATED.

Medicine

BY

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REMARKS

ON THE

NATURE AND TREATMENT OF "BLACKWATER FEVER,"

THE

"FIÈVRE BILIEUSE MELANURIQUE" OR HŒMATURIQUE OF FRENCH WRITERS.

From all the facts which have come to my knowledge, some detailed in the annexed reports of cases, no doubt exists in my mind, of the paludal or malarial origin of this fever.

English writers on diseases of tropical climates are singularly silent on this subject. *Boyle*, *Clarke*, *Chisholm*, *Pym*, *Pritchett*, *Daniell*, *Horton* and others who have written on diseases of Western Africa, do not refer to it. *Tidlie*, quoted by *Boyle* (*Practical Medico-Historical Account of the Western Coast of Africa. London*, 1831), describes the urine in the endemic fevers of Cape Coast as having the "appearance of bloody water." To the medical staff of the French navy we are indebted for almost all that we know of this particular form of fever, described under various names, *e.g.*, *Fièvre Ictero hemorrhagique; e F. pernicieuse icterique; Accés Jaune; Fièvre Jaune des Créoles et des acclimatés; F. bilieuse nephrorrhagique; F. bilieuse hematopoietique; F. b. urohæmatique; F. icterodes remittens*; &c.

The first case that came under my observation was that of *W.*, already detailed, and my diagnosis at the time lay between Acute Yellow Atrophy (*Icterus gravis*) and Malignant Hæmorrhagic Malarial fever.

My second and following cases, of a series of four, occurred during an endemo-epidemic of malignant bilious fever in the Quittah district, in 1881, when, in consequence of the drought of the season, the extensive Quittah lagoon, which had remained full for the previous twelve years, suddenly began to dry up, exposing its alluvial banks to an overpowering sun.

During this period the progressive intensity of the action of the malarial poison could be clearly traced in the forms of resulting fever; simple intermittents followed by malignant intermittents, remittents and the fever under review.

The following appear to me to be some of the peculiar clinical features of this fever.

I. It only attacks those whose healths have, for some reason or other, become deteriorated.

II. It is very often preceded by simple attacks of intermittent fever, with progressive anæmia and sallowness of countenance.

III. The onset of characteristic symptoms is invariably sudden.

IV. The quality of the vomit and urine peculiar.

V. The jaundice is uniformly distributed, not in patches of varying degrees of intensity. It is seen from the very first onset of the disease, and varies with the general condition.

VI. The type of accompanying fever, remittent or unremittent, and this even in the worst cases.

VII. The appearance of face dejected; conjunctiva yellow, but not injected.

VIII. Tenderness in gastro-hepatic region.

IX. The pulse follows the fever.

X. It it not contagious.

In all these respects this fever differs from yellow fever.

Two great errors prevalent with reference to this form of fever may be here discussed.

I. That the symptoms are due to the jaundice, or to disordered action of the liver.

II. That the colour of the urine is due to the presence of bile in it.

The progressive sallowness noted as having been observed in all the cases detailed, is to be explained not by progressive functional inactivity of the liver, causing retention of the elements of bile in the blood, or to the absorption of bile into the blood from the intestinal canal after an excessive secretion by the liver, a true hypercholia; on the contrary, the explanation is to be found in the gradual but progressive alteration in the quality of the blood itself due to the subtle and insidious influence upon it, of the malarial poison.

What the malarial poison is, we do not know, all that we do know are the conditions under which it is evolved. The attempt which has been made recently to revive its animalcular and parasitic nature, cannot be said to have led to any practical results, pathological or therapeutical. It is nevertheless worthy of note, and I have not seen this point insisted upon elsewhere—that *Sternberg*, in his observations, undertaken to confirm the researches of *Klebs* and *Tomassi-Crudelli*, found septic organisms invariably associated with the so-called malarial germs; the possibility of so-called malarial fevers becoming complicated with this septic element, is easily understood—a septic element to which might be attributable symptoms wholly inexplicable by the known action of the malarial poison. And there

are clinical facts in support of this assumption. It is true that this septic element is not necessarily required to explain any given case of malarial fever, still, its possibility, especially in considering the form of fever under review, which in so many respects is nearly allied to yellow fever —a truly septic disease—should not be lost sight of.

The effect of the malarial poison upon the chemical constitution of the blood is well known and is evident, clinically as well as pathologically, by the decrease in the corpuscular richness of the blood (*anæmia*) with the coincident presence in this fluid of the *pigment granules* of *Frerichs*, pointed out as long ago as 1837 by *Meckel*, which are also found in the liver, spleen, and also in the brain.

The condition of the blood in "*Blackwater Fever*" is that which has recently been aptly described by *Ponfick*, under the term *Hæmoglobinæmia* (*Berliner Klinische Wochenschrift, No.* 26, 1883). This condition of the blood is also found in scurvy; purpura hæmorrhagica; after poisoning by phosphorus; inhalation of C O_2, H C N, and arseniuretted hydrogen gases [*Vogel*]; after typhus and scarlet fevers; after transfusion of blood, especially if from different species; in hæmophilia; injection of pyrogallic acid, potassic chloride or glycerine (*Schwann*, in *Eckhardts' Beitrage für Anat. and Physiol.* 1880, *p.* 634); as an epidemic disease in Dresden during March and April, 1879, among the new-born, during which 78 per cent. of all born died [*Bursch-Herschen; Feld, Handbuch der Kinder Krankheiten, Vol. IV.*]. In all these cases the peculiar urine was noted.

A certain amount of hæmoglobinæmia may be considered as physiological; the colouring matter of the red blood discs set free into the blood-plasma being changed partly into biliary or urinary pigment and partly going to

nourish muscular tissue (*Neubauer* and *Vogel*, "*On the Urine*," *p.* 311). In these cases there is neither hæmoglobinuria nor icterus. When this alteration of the blood corpuscles, for one reason or another, becomes greater, the altered products are disposed of in three directions: (*a*) the spleen is enlarged with the fragments; (*b*) the liver secretes an excessive quantity of bile, hypercholia—an effect, not a cause; and (*c*) the hæmoglobin set free into the blood-plasma is excreted by the kidneys. In all these cases, however, both the hæmoglobinæmia and the icterus are slight and transient. In a third class of cases, however, in which the decomposition of the blood corpuscles takes place too suddenly or to too great an extent to be disposed of as above, the colouring matter is transformed into oxyhæmoglobin and methhæmoglobin, and in the form of the latter is excreted by the kidneys, being a crystallizable substance and readily passing through animal membranes (*Hoppe Seyler*). In these cases, the hæmoglobinuria and jaundice are both well marked and associated with more or less exudative nephritis—the precise conditions found in "*Blackwater Fever.*"

The *à posteriori* argument of the success of quinine might be adduced in support of the paludal origin of this fever, for it is well known that quinine signally fails in yellow fever.

The diagnosis of this fever from other forms of bilious fever, certain forms of acute hepatitis, acute yellow atrophy (*icterus gravis*), and uræmic coma occurring in a malarious subject, is sufficiently marked, and need not, in a communication of this kind, be detailed.

That the colour of the urine is not due to the presence of bile, or bile pigment in it, is, to me, evident from my not finding it in any of the specimens I examined either at Quittah or at this station. My Quittah observa-

tions have been confirmed by both *Professor Sydney Ringer*, of University College Hospital, and *Dr. Wickham Legg*, of St. Bartholomew's Hospital, London, neither of whom was able to obtain the reaction of bile in the specimens I submitted to them, but on the contrary, the spectrum of hæmoglobin. Microscopy revealed a few blood corpuscles, more or less altered, amorphous granules, a few epithelial casts, triple phosphates and acid urates. Heat and HNO_3 gave a variable proportion of albumen. The urine treated with sodium chloride and strong acetic acid, exhibited under the microscope, the characteristic crystals of Hæmatin.

Karangua (*Centralblatt für die Med. Wiessen*, 1882, *No.* 35, *quoted in London Med. Record*, *Nov.* 15, 1882) states that the dark colour of the urine in icteric malarial fever is due to the presence of Hæmoglobin. According to *Barthélemy Benoit*, who was the first that attempted a systematic description of this disease (*Archives de Med. Navale, Paris*, 1865, *t. iv.*), the colour of the urine is due to blood. This is also the opinion of *Pellarin* (*Arch. de Med. Navale, t. iii.*, 1865), of *Dutroulau* (*Traité des Maladies des Européens dans les Pays Chauds*, 2*me Edit.*, *Paris*, 1868), and of *Hugoulin* and *Borie* (reported by *Barthélemy Benoit*); but denied by *Beranger Feraud* ("*De la fièvre bilieuse mélanurique*," *Paris*, 1874, *p.* 280), and *Daullé* (*Thèse de Paris*, 1857), both of whom attribute the colouration to the presence of bile.

Assuming once the paludal nature of the poison, all the other associated symptoms are easily explained.

As regards prognosis, this must always, in view of the state of the blood, be necessarily grave—a gravity proportionate to the associated symptoms and the more or less debilitated condition of the constitutional powers prior to the attack.

As regards treatment, quinine in large doses persistently administered; calomel at the onset and occasionally afterwards as required (note the case of *S.*); stimulants: local sinapisms, blisters or fomentations, with the treatment of individual symptoms as they arise; and in general, supporting the strength of the patient, seems to me to offer the best chances of successfully combating the disease. With reference to the influence of calomel in this and other forms of bilious malarial fever, my experience is decidedly in its favour in the early stages of the fever, in doses of from 10 to 20 grains. It would appear to act not only as is well known, upon the liver, but also as a sedative to the stomach, and as antiputrefactive upon the contents of the intestinal canal, thus minimising that amount of *auto-infection* which, in fevers of this kind, is extremely likely to occur and the possibility of which is often lost sight of.

From a hygienic point of view, the following facts stand out prominently in their etiological relation to this fever.

1. The varying intensity of activity of the malarial poison at any given place or at any given time.

2. Individual predisposition resulting from constitutional debility, no matter how occasioned.

3. The pernicious effect of repeated attacks of intermittent fever, which are generally regarded as of slight significance and disregarded.

In conclusion, I would add that the notes of these cases, that of the late Mr. W. excepted, were never intended for publication at the time they were written, but for my own guidance. In submitting them in their

present imperfect form, I have been actuated by the hope that they may yet throw some light upon the obscure field of *West African pathology*.

I append three temperature charts of remittent fever as ordinarily met with.

J. FARRELL EASMON, M.D.

Acting Colonial Surgeon, &c.

APPENDIX I.

AUTHORS

REFERRED TO IN THE

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BY

DR. J. FARRELL EASMON.

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J. FARRELL EASMON, M.D., &c.

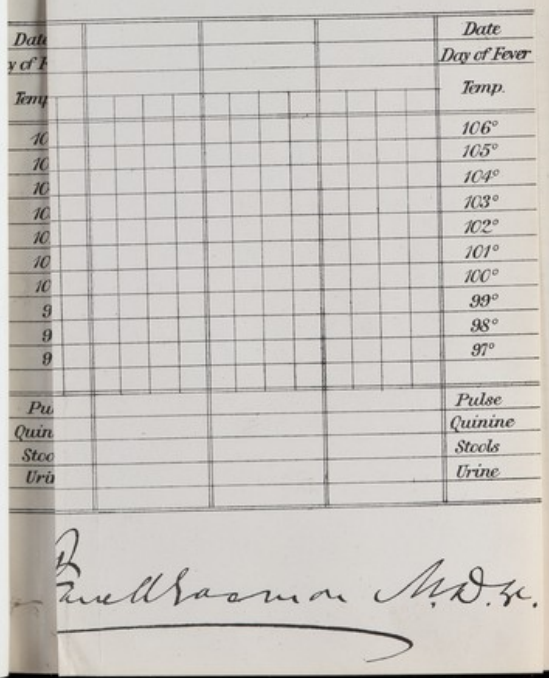
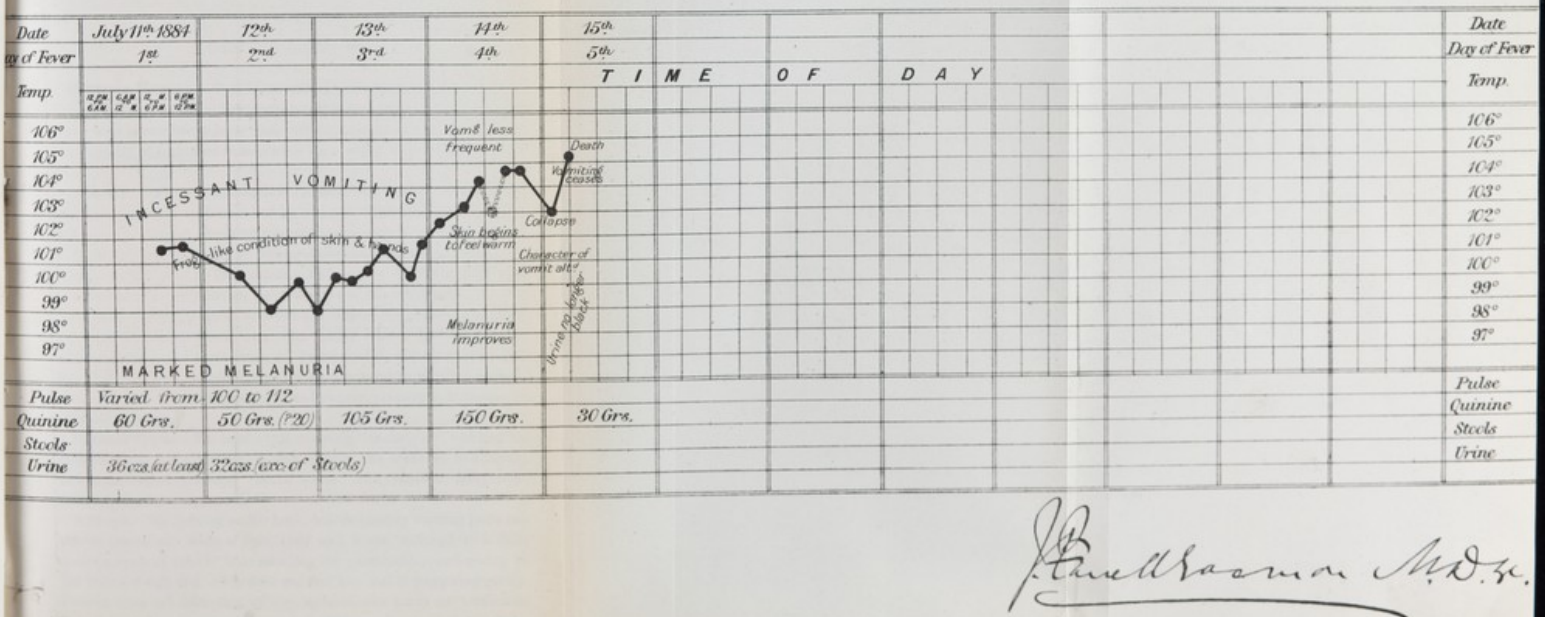


Chart N°. 1.

Case of H.W.W.

European. Ætat 22.

Fièvre Bilieuse Mélanurique Sidérante



J. Farquharson M.D. &c.

APPENDIX II.

REPORT OF THE CASES OF H. W. W., G. W., S., H., AND T., AND CHARTS OF CASES OF H. W. W., S., H., T., L. AND N.

CASE OF H. W. W.

PREVIOUS HISTORY.—This is his second tour of service in the Colony. During his first tour, he kept very indifferent health, was constantly down with intermittent fever and bilious (non-febrile) attacks, due in the majority of instances to overwork and worry and irregular meal hours.

After the usual leave of absence he returned to the Colony about [illegible] months ago. On his arrival he was not "looking" well, but soon [illegible]r slight attacks of intermittent fever which he had [illegible]go, due to seasonal change and atmospheric con- [illegible]et to take quinine, he has gone on fairly well. On [illegible]sulted me for neuralgia of the left hand.

[illegible]" quite well the day before his illness and went [illegible] for a long ride. After dinner he was noticed, [illegible]ne of cards, to be somewhat absent-minded and [illegible]as attributed by those present to physical exhaus- [illegible]s the sequel proves however, primary manifestations

[illegible]—He awoke this morning "feeling fit" and had his [illegible] 11—7—84
[illegible] after this, feeling unwell, he went to bed again, and soon began passing "black water" and vomited frequently. Skin rapidly became jaundiced.

4.30 P.M.—He is lying on his back, but frequently turning from one side to the other. Skin of face, body and limbs, suffused with bile, uniform spots of prickly heat standing out prominently, and giving to the skin a rough feel. Skin does not feel hot, and is perspiring gently. Patient does not complain of any spontaneous pain, no tenderness over liver, spleen or stomach, no photophobia, Temp. 101·6. Pulse

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fièvr
30
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fièvr
Pari
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33

APPENDIX II.

REPORT OF THE CASES OF H. W. W., G. W., S., H., AND T., AND CHARTS OF CASES OF H. W. W., S., H., T., L. AND N.

CASE OF H. W. W.

PREVIOUS HISTORY.—This is his second tour of service in the Colony. During his first tour, he kept very indifferent health, was constantly down with intermittent fever and bilious (non-febrile) attacks, due in the majority of instances to overwork and worry and irregular meal hours.

After ti[illegible] 6 . 7 [illegible]sence he returned to the Colony about three mor[illegible]rival he was not "looking" well, but soon rallied, a[illegible]ttacks of intermittent fever which he had about si[illegible]o seasonal change and atmospheric conditions, [illegible] quinine, he has gone on fairly well. On the 5th [illegible]e for neuralgia of the left hand.

He [illegible] well the day before his illness and went out in [illegible] long ride. After dinner he was noticed, while [illegible]ards, to be somewhat absent-minded and forgetf[illegible]ibuted by those present to physical exhaustion fro[illegible]quel proves however, primary manifestations of blood poisoning.

PRESENT STATE.—He awoke this morning "feeling fit" and had his bath as usual, but after this, feeling unwell, he went to bed again, and soon began passing "black water" and vomited frequently. Skin rapidly became jaundiced. 11—7—84

4.30 P.M.—He is lying on his back, but frequently turning from one side to the other. Skin of face, body and limbs, suffused with bile, uniform spots of prickly heat standing out prominently, and giving to the skin a rough feel. Skin does not feel hot, and is perspiring gently. Patient does not complain of any spontaneous pain, no tenderness over liver, spleen or stomach, no photophobia, Temp. 101·6. Pulse

100 small, of moderate volume and strength. Bowels have acted. R. Pill. quin, gr. ij., ss. iv., every hour for three doses, then every two hours. Hands cold and clammy, frog-like. Has passed about a pint of melanurious urine of a dark coffee colour. Sinapism to stomach and liver. Mist. Diaphoretic ℥ i. 2 grs. dis. Calomelanos R. x. statim.

9.45 P.M.—Since last note took quinine grs. xx., and bowels acted twice. Has just taken a third x. grs. dose of quinine. Temp. 101·8. Pulse 100. To repeat quinine 10 grs. every hour till cinchonism. Did not retain mixture, vomited several times. Repeat sinapism.

—7—84. 8 A.M.—Temp. 100·6. Pulse 100. Has had 30 grs. of quinine since last note (*i.e.*, 60 grs. altogether). 3 stools. Melanuria improved. Peculiar frog-like feel of hands continues. Feet, however, warm. To have champagne and soda *ad lib.*

2.30 P.M.—Pulse 102. Temp. 99°. Since last note 20 grs. quinine. 2 stools. Could not retain champagne and soda. Retained some chicken broth and brandy and water. Just now a further stool is passed, small, pultaceous, highly bilious, not offensive. Mist. Soda Effervescens 2 ndis. horis.

9.30 P.M.—Temp. 100·2. Pulse frequent and small. Patient feels warm, but his hands are cold and clammy. Skin cool. Vomiting frequently. Skin acting.

12 P.M.—Temp. 99°. Pulse as before. Fairly quiet since last note, but for last half-hour vomiting returned. Skin cool. No pains anywhere. Has not slept. Inj. Morph. Hyp. ♏x., statim. Repeat sinapism over liver, spleen, and stomach.

—7—84. 12 P.M. TO 1 A.M.—Gradually quieter.

1 A.M. TO 2.15 A.M.—Fast asleep.

2.15 TO 3.30 A.M.—Resting quietly; one stool.

3.30 TO 4 A.M.—One stool; vomiting returns.

4 A.M.—Repeat Inj. Morph. Hyp. ♏x.

4.30 A.M.—Restless.

4.30 TO 5.30 A.M.—Quiet. Mostly asleep.

5.30 A.M.—Passed urine, which is still melanurious. Temp. 100·4. Vomited on sitting up to pass urine.

8 A.M.—Has rested quietly since last note. Took a cup of tea at 7, but brought it up at 7.30. Pulse is, if anything, slightly improved in quality—103. Hands not so cold and clammy as yesterday. Enema of quinine, grs. xv., brandy ℥ j., chicken broth ℥ vj. statim. Temp. 100·2.

11.30 A.M.—Vomited twice since last note. One stool two hours after enema, in practically the same condition. Dozes off. Skin less

clammy but hands still cold. Can keep down iced water in small quantity, but iced brandy and water is at once rejected by stomach. To have inj. quin. grs. xxx. statim., and persist in brandy and soda iced (1 in 10) ℥ j. every five minutes. His skin appears less jaundiced. Inclusive of what is passed with stools, urine ℥ viij., if anything slightly better than last note. Temp. 100·6. Pulse 105.

1 P.M.—Had no stool and has not vomited since last note, is however very restless otherwise, though he tries to sleep. R. Inj. Morph. Hyp. ♏xv. statim.

2.30 P.M.—Neither stool nor vomit since 11.30 a.m. Had two dozes of half an hour each from which he was awakened by drumming and firing of guns of native custom in town. Skin warmer and healthier feel. Hands not so cold and clammy. Temp. 101·6.

7.30 P.M.—Temp. 100·4. Pulse 105. Has had several fits of vomiting since last note, and has not slept. Hands cold. Inj. Quin. grs. xxx.

9 P.M.—Has had one stool and passed urine ℥ ij., much better. Vomited once.

11 P.M.—Temp. 100·8. Half an hour ago had inject. Morph. ♏xv. Skin not acting freely. Inj. Quin. xxx. grs.

1.30 A.M.—Temp. 102·6. Has been very irritable since last note. 14—7—84. Breathing, panting—occasionally Cheyne-Stokes. Vomited three times, the character of which has altered to a darker shade. Passed urine ℥ iii. just now, much better in appearance. Seems slightly deaf. Retained enema and has not since had a stool.

2 A.M.—Inj. Quin. grs. xxx., passed urine ℥ iij., decidedly better. Skin hot, non-perspiring.

2.30 A.M.—Head hot, patient very restless. To have ice-cold cloths to head, and ice bag to back of neck.

3 A.M.—Skin still hot and non-perspiring, but patient decidedly less restless. Took a tumblerful of soda-water at a gulp, which brought on vomiting. Hands getting warm.

4.50 A.M.—Inj. Morph. Hyp. ♏xv. Has vomited once again since last note, and in fact every attempt to take more than one tablespoonful of fluid at a time, or to sit up in bed, or at stool, brings on an attack of vomiting, which is now of the darkest shade of green, looking almost true black. He is deaf and wanders slightly. Had one stool.

6.30 A.M.—Temp. 103·2. Has rested for about one hour since last note, the effect of ice to the head, but has not gone off at any time into a proper sleep. His pulse is of better volume than it has ever been,

but still weak and compressible—106—and intermittent as to force and rhythm. Has just brought up one large gush of dark green, almost black vomit. Skin is hot and moist, non-perspiring. Tongue drier, especially at back, and a band of a dark brown along each side of dorsum. Edges and centre of tongue less coated. Injection of 8 ozs. chicken tea and ℥ ij. brandy at once.

11 A.M.—Temp. 104·2, Pulse 115. Vomiting still persists. Had a nutrient enema at 8.30, since when has had three stools. Melanuria remains in *statu quo*. Still deaf. Seems dull but memory good. Pulse is of better volume although still weak. Extremities not so corpsy to touch. Fairly quiet. Inject. Quinine grs. xxx., and brandy ℥ ii. Inunction (and friction) of ℥ j. Ol. Carbol. (1 in 20).

1 P.M.—Temp. 103, Pulse 115, R. 14. Respiration very Cheyne-Stokes, in series of twos and fours, with proportionately long intervals between them. The pupils are contracted to the size of a large pin's head—in fact, since the beginning of the illness this has been a noteworthy feature. Conjunctivæ, which yesterday became less suffused with bile pigment, are now more so. Has had one stool since last note. Here I may observe that ever since the injections have been commenced the stools have consisted of portions of said enemata more or less bile tinged. It is especially worthy of note the absence of all fœtor with these stools. R. Sp. Vin. Gall. ℥ ij., beef tea ℥ vij., Sol. Acid. Carb. in Glyc. Alcohol and water—2 grs. Ft. enema statim.

3.15 P.M.—Has been getting restless again. Skin and head hot—ice-bag still applied. P. 115, R. various 20–35, T. 104·6. Respirations still Cheyne-Stokes.

3.30 P.M.—Pulse small and intermittent in force. Inj. Quin. grs. xxx.

7 P.M.– Since last note has vomited several times, and also been restless. T. 104·6, P. 120, R. various, markedly Cheyne-Stokes.

7.30 P.M.—Inj. Quin. grs. xxx., Acid. Carb. grs. iv.; chicken broth ℥ vj., brandy ℥ ij. statim.

9.20 P.M.—Called to see him hurriedly, is in a great state of alarm, he is dying. Pulse small, flickering, slow. T. 103·2; R. as before. Empl. Sinapis to heart and calves at once. Mustard friction to extremities, and turpentine stupes to abdomen.

Mustard took rapidly, and immediately after the reaction, skin and head began to grow hotter—ice, cold cloths to head.

9.30 P.M.—R. Quin. grs. xxx., Acid. Carbol. grs. iv., brandy ℥ j. ss., Etheris Sulph. ℥ j., chicken broth ℥ vj., Fiat enema statim.

N.B.—Since 4 P.M. patient has been complaining of pain in his

throat, which hurts him in swallowing, and gives him great distress. When seen by me at 7 P.M. he was still complaining, but on examination his tongue was found beautifully moist. Since 7 A.M. the vomiting has lost the characteristic chopped spinach or coffee-grounds appearance, it now consists of mucus plus ingested fluid.

Quality of urine has coincidently markedly improved. His voice is quite altered. Aphonic-deaf.

11 P.M.—Has just had a stool. Very restless. Almost pulseless. Skin cold and clammy. No vomiting, but retching. Inj. Ætheris Hyp. et enema stimulus.

1.40 A.M.—T. 103, P. uncountable for restlessness. Got algid again within past half hour. Brandy ℥ ij., tereb. ℥ ss., æther ℥ ij., beef tea ℥ vj. injected. Mustard frictions and turpentine cataplasms to pit of stomach and abdomen. 15—7—84.

6 A.M.—T. 105·2. Since last note patient has had one attack of collapse, during which he remained pulseless at wrist for about ten minutes, and to all appearance dead. Inject. Ætheris Hyp. syringeful, friction with mustard and turpentine stupes—rallied and fell into a condition of low muttering delirium. During past half-hour has lain quietly, only occasionally "picking at the bedclothes."

6.20 A.M.—Five minutes ago patient became unmanageable and tried to get out of bed. Fell back in bed apparently dead. Inj. Ætheris syringeful. Frictions with mustard and turpentine stupes. Enema of brandy ℥ ij., Quinine grs. xxx. Ol. Tereb. ℥ ss., and chicken tea ℥ vi.

7.10 A.M.—Since last note, has been on the whole quieter. The rally, however, was only brief. He is at present pulseless. Conjunctiva insensible to touch. R. 52. Rattles begun.

7.40 A.M.—Gradually sunk and died quietly—respiration continuing after heart's action ceased to be audible.

ANALYSIS OF URINE.

Specimen First Passed.

Dark port wine, almost coffee colour, thick and frothy. The froth crimson; shaken about in the night chamber, the edges have a crimson appearance. S.G. 1,028. Acid. Albumen = $\frac{1}{16}$ (roughly). Gmellin's test yields negative results—no reaction of bile. Pettenkofer's test not tried. Deposits on standing equal to one-eighth, of a brownish red—the supernatant liquid clear, but after a couple of

days, separates into two portions, the upper and smaller being darker in colour. Microscopy reveals brownish granular detritus, epithelial scales (renal), and minute casts, and here and there a blood corpuscle more or less broken down.

Deposit treated with Sodium Chloride, dried, and then with strong Acetic Acid yields characteristic crystals of Hæmatin. Under the microscope are also seen crystals of phosphate (triple) and acid urates (dissolved by Liq. Potassæ).

B. Specimen passed during first night of fever.

Present characters precisely as the foregoing.

C. Specimen passed during the second day of illness.

S.G. 1,025. Acid Albumen a tenth. Blood corpuscles not so readily seen—other characters as before.

D. Specimen passed the night before death.

Acid S.G. 1,017. Heat and H N O_3 give a perceptible cloudiness—few epithelial casts and granules—colour of ordinary high febrile urine—no blood corpuscles detected in three slides—no reaction with Gmellin's test.

In no single instance was I able to obtain the reaction for bile.

Note.—The suddenness of onset; the extreme gastric irritability; the rapidly-developed jaundice; the "black" urine and the peculiar vomit, which by themselves were sufficient to make the prognosis a grave one, were, unfortunately, associated with a cold, clammy, frog-like condition of the hands and body, a weak small pulse, and a degree of temperature wholly disproportionate to the general symptoms, which showed that the reaction of the system to the imbibed poison (Hæmal condition) was inadequate to meet the strain put upon it, and intensified the gravity of the prognosis. The subsequent clinical history fully bore out this pernicious character, and death resulted from the inability of the system to rally from the condition into which it was thrown—the heart failing to respond to the increased demand upon its structural organisation.

The alteration noted in the character of the vomit on the day before death—its assuming a dark green, almost black, colour, is, perhaps, explained by the rupture of some minute vessels in the coat of the stomach. It is none the less noteworthy, that after cessation of this particular vomit—which was, in fact, more a regurgitation in sudden gushes without any effort, than a vomit—the matter subsequently vomited consisted simply of mucus with whatever fluid was drunk—not even bile-tinged. There was no blood or semblance of it in this last vomit.

I attribute the pains in the throat to the intense acridity of the peculiar vomit. It is worthy of note that the temperature, in this as in my former fatal case (T.), rose before death to 105·2° F., in both cases the temperature rose steadily towards the end.

As regards treatment, quinine evidently failed to arrest the progress of the fever, although the quality of the vomit and urine were on the whole altered apparently for the better.

Ice-cold applications to the head gave only temporary relief to brain symptoms, but were without effect upon the general condition or temperature; in fact the head and neck became icy-cold when the thermometer in mouth or axilla showed a continuous rise of temperature. The use of Carbolic Acid was begun too late for any definite results to be attributed to its action. As adjuvants to the foregoing add sinapisms, turpentine and carbolic frictions, stimulating and nutrient enemata, and turpentine fomentations were used as circumstances arose. Sucking ice and ice-cold drinks had not the slightest effect upon the vomiting.

J. FARRELL EASMON, M.D., &c.

CASE OF W.

G. W., native of Sierra Leone, fell ill nine days ago at Little Popo.

All I can discover is that he suffered from fever, which rapidly became worse with vomiting and that he gradually got more and more yellow about the eyes. Up to early yesterday he was conscious and kept down a little food and had passed water, which was described as being very red.

10.30 A.M.—When I first saw him, has been drowsy since last night. Has been brought hither (Quittah) from Little Popo, 40 miles, in hammock, and has just arrived. Has been muttering incoherently in the hammock all the way. Has not passed water since 5 p.m. last evening. Bowels had not acted for three days. He is lying on his back in bed, with eyes half closed and muttering incoherently; wakes up, when roused, and recognises those around him, but soon he lapses again into a state of stupor, picks at bed clothes, constantly taking his hands from underneath the bed clothes. His conjunctiva is intensely yellow and so are his nails, and the dark hue of his skin

assumes a greenish aspect. His skin is cool and moist with a cold clammy perspiration. Hands and feet cold. Tongue tremulous and deeply furred, sordes about teeth, from the oral mucosa blood oozes, and the conjunctiva looks congested and muddy. Pupil medium size and reacts feebly. Has just passed about ℥ iv. of bloody urine, almost all blood.

Temp., 97; pulse, 67; respiration, 15.

℞ Ol. Ricini.
Ol. Terebinth āā ℥j.

Et cetera, ut Fiat enema. M.D. Utend. statim.

Apply hot bottles to feet and abdomen, and blister to nuchæ.

Mist. Ætheris Co. ℥j. omni hora.

11.30 A.M.—Enema has acted, bringing away a lot of foul smelling dark greenish fæces.

℞ Enemata Quinine grs. xl., 3 tiis.

2.30 P.M.—Patient rapidly sinking. Comatose. Pulse, flickering.

2.45. P.M.—Died from exhaustion. No convulsions.

J. FARRELL EASMON, M.D., &c.

CASE OF S.—ÆTAT 29. GERMAN.

PREVIOUS HISTORY.—Has been on the coast for about a year in the malarious regions of the interior at Howe. He had several attacks of malarial fever, which at first were of weekly, but latterly of monthly recurrence; quinine, in the doses he took it, seemingly not being sufficient to break the chain of periodicity. Came to Quittah a fortnight ago for a change from the interior, and since his arrival has had fever every second day, but was able to walk about and see his friends till yesterday, when he was obliged to take to his bed.

JUNE 28. 2 P.M.—I find the patient lying in bed on his back and complaining of pains in the loins. Skin hot, non-perspiring. Has vomited several times, and on the slightest attempt to take anything, even water. Vomit of a dark greenish fluid with particles floating in it, resembling chopped spinach. He says it tastes bitter; stains the bed clothes. Pulse is 104, medium size, easily compressible, quick. Conjunctiva deeply yellow and so the buccal mucosa and nails and skin generally. Respiration hurried slightly and short, 24 (?). Urine of a dark port wine colour, almost black, about 12 ozs. passed at one time. Temp. 104·2.

No tenderness over stomach, liver or spleen, except on deep pressure over the stomach. Bowels have not acted since yesterday.

℞—Enema Simplex statim.

℞—Catapl. Sinapis Epigastrio.

5 P.M.—Urine still melanurious, but passed in fair quantities.

Repeat enema, as patient very much better after the first. Temp. 102°. To have champagne ℥j. 2 dis., and weak chicken broth occasionally in ℥ ss. doses.

JUNE 29. 10 A.M.—Urine still melanurious but not so dark. Stools tarry consistence, dark, with traces of slimy mucus. Patient feels very weak. Temp. 99·2. Vomiting has ceased since midnight.

℞ Quinine, grs. x., statim.

Give champagne freely.

12 A.M.—Has vomited again some green stuff. Temp. 99°.

℞ Quiniæ Sulph., grs. xxx.
Tr. Opii, ♏ xx.
Aquæ Callidæ q. s. Fiat inj. statim.

Urine still bad.

JUNE 29. 3 P.M.—Temp. 100. Urine still bad as ever. Patient restless and drowsy; weak, but irritable.

Repeat inj. Still vomiting.

℞—Ol. Tereb. ♏ x. in mucilage of acacia, statim.

6 P.M.—Has slept a little. Vomited the draught about half an hour after swallowing it; has vomited since. Vomited matter was green but rather slimy; patient feels on the whole better, and is more quiet. Repeat.

Ol. Tereb. ♏ x. statim. Temp. 99. It may be noted that during this day the patient took 3½ pints champagne.

JUNE 30. 8 A.M.—Temp. 98·6. Urine not bloody, but still high-coloured.

Inj. Quinine, grs. xx.
Tr. Opii, ♏ xx.

Patient slept well last night till 3 a.m. Has vomited a little greenish fluid. Had a clyster early this morning, which has just acted. Stool very bilious and tarry. Patient, though very weak, is much better.

11 A.M.—Temp. 98·4. Urine not bloody, but still high-coloured.

Inj. Quinine, grs. xx.
Tr. Opii, ♏ xx.

Has had several stools of slime and bile.

3 P.M.—Temp. 100. Urine almost normal in appearance.

Quinine, grs. xx.
Tr. Opii, ℥ xx.

To have Calomel, grs. 10, at bedtime.

JULY 1. 8 A.M.—Temp. 99, urine normal. Slept a little; had to wake up several times to take stool. Stools slimy and dark green, with here and there traces of blood, in fact, dysenteric. Skin much clearer and cool. Has not vomited since last note.

11 A.M.—Temp. 100·2. Stools dysc., had 3 since last note.

℞ Quiniæ Disulph., grs. xx.
Acid. Sulph., dil. ℥ xxx.
Tinct. Opii, ℥ xxx.
Vin Porti, ℥ j.
Beef Tea, ad. ℥ viij.
Ft. enema statim.

3 P.M.—Has had two dysenteric stools, the last with scarlet blood. Skin hot, and non-perspiring. Pupils slightly contracted. Localised pain over liver. Temp. 102°.

℞ Quiniæ Sulph., grs. xx.
Acid. Sulph. dil., ℥ xx.
Tinct. Opii, ℥ xx.

Et cetera. Enema statim.

6 P.M.—Has had two bloody stools, and retained last enema. Temp. 102·2.

JULY 2. 8 A.M.—I find patient fast asleep, and his skin feeling a little hot and dry, and breathing quietly. Temp. not taken.

11 A.M.—Temp. 102·2. I learn that contrary to my orders, and without my knowledge, early this morning a starch and opium enema was given by a brother clergyman resident. Has had a stool since, but no blood passed. Quinine, grs. xxx. statim. Patient restless, skin hot and non-perspiring.

3 P.M.—Fast asleep, skin very hot.

6 P.M.—Temp. 103·2. No headache. Tongue rather dry and brownish; skin still hot, and non-perspiring; no pains anywhere.

℞ Quinine, grs. x.
Calomel, grs. v.
by mouth, statim.

JULY 3. 8 A.M.—Temp. 101·2. Slept well, but had to go often to stool, which, however, is no more bloody. Tongue moist, skin perspiring, pulse regular and soft, 84.

6 P.M.—Temp. 101·2. Pulse, moderate strength. Since last note

has had 32 grs. quinine in 3 grs. pills, ii. every hour. He feels decidedly better. Has had two stools.

JULY 4. 10 A.M.—Temp. 99·0. Had a good night, slept well, three stools. Skin cool and moist. Tongue almost clean. Stools stinking but not bilious. To continue two 3 grs. pills of quinine every hour.

5 P.M. Temp. 99. Has had only 8 pills, as Cinchonism was produced, they were discontinued. Is deaf, and cannot see well. Had two stools. No complaint.

JULY 5. 10 A.M.—Temp. 98·4. Slept very well, and felt so well this morning that he got up and dressed himself, and went to adjoining room. Has had four stools since last note. Appetite good.

JULY 6. 10 A.M.—Temp. 98·4. As yesterday, slept, but complaining of looseness of the stools, and especially requests to have the bowels stopped a little. I ordered an astringent draught to be taken, should the looseness continue after mid-day.

JULY 7. 10 A.M.—Temp. 102·4. Dysenteric diarrhœal stools arrested by the astringent draught, but fever has supervened and obliges patient to return to bed, although, however, he states he does not feel ill. Tongue dry. Skin now perspiring.

5 P.M.—Temp. 104·2. Has had only one stool since last note. Restless and irritable. Skin dry.

℞ Calomel, grs. x. hora somni.

JULY 8. 10 A.M.—98·4° F. Had copious evacuations, and perspiring freely during the night. Had eight grs. quinine at 6 a.m., and now patient feels so well that he is again out of bed, and I find him writing. ℞ quinine, grs. eight, every two hours. The patient took quinine for the next two days, and was quite convalescent. He was then put on chalybeate tonics, very mild at first, and gradually made stronger, and in 10 days left for a change up the hills at Acropong, where, after staying a short time (six weeks), he returned much renovated. He refused to go to Europe or Madeira, as recommended in the first instance.

SUBSEQUENT NOTES.

JANUARY 1, 1882.—Patient did not take quinine, as advised, and discontinued tonics. Has had two more attacks of fever, and has been away for two months to Accra and returns a ghost of himself. Has not been under me since last note.

APRIL 1.—Patient has had a third trip to Accra, where he also had a severe attack of fever. Still very anæmic and slightly bile-tinged.

Since he first came under my care up to the present time he has not done six weeks' work.

JANUARY, 1883.—Patient has been constantly ill, has married, and is now compelled to go to Europe for a change.

REMARKS.

This case presents several points of interest, especially from a therapeutic point of view. The patient had been previously debilitated by repeated attacks of intermittent fever, but was possessed at the same time of great moral courage and made up his mind not to die. When during his illness, I suggested the advisibility of his returning to Europe, he plainly told me that he had made up his mind to remain a certain number of years on the coast, and that he was determined to do so or die at his post.

Calomel and quinine both answered admirably, and although to the former may be attributed the dysenteric symptoms which supervened on the cessation of the melanuria, yet, as the sequel shows clearly, and further experience is confirmatory, this action was, on the whole, salutary and is, to my mind, extremely suggestive.

Specimens of the urine were forwarded to Professor Ringer and Dr. Wickham Legg, of London, but neither of these physicians—and one of them, the latter, is a specialist on this subject—was able to detect bile; on the contrary, the microscope and spectroscope revealed the presence of reduced blood.

CASE OF H. AGE 20, GERMAN.

PREVIOUS HISTORY.—Has been eighteen months in West Africa, residing mostly at *Quittah*. Recently has been stationed at *Bagidah*, where he has almost constantly suffered from intermittents or mild remittents; has had to leave his factory and come up to Quittah for a change at least three times in the past four months. Has never drunk beer since his arrival in the tropics. His usual drinks are fruit syrups or vinegar and water. Arrived ten days ago for similar reason, has been having intermittents of mild form, however, ever since his arrival. Yesterday took quinine in the morning. In the afternoon felt feverish and took to his bed, had some more quinine,

did not sleep during the night, but was roasting with fever and vomited often. This morning fever still high, but skin moist, bowels acted once, but nature of stool not observed. At 9 a.m. passed melanurious urine, about 10 ounces at one time. I was sent for.

10 A.M.—Patient is lying quietly on his back, highly flushed cheeks and throat, skin hot but moist. Pulse feeble but soft and quick. Tongue moist and coated in centre with brownish fur, whitish at tip and edges. Tremulous. Respiration quiet and easy. There is no tenderness over liver and spleen, nor apparent enlargement of either of these viscera, but in the lumbar regions over the kidneys, especially the left, there is a deep-seated pain on pressure. Patient has very slight headache just now, but this was worse last night.

Vomited much last night and once this morning, greenish fluid, with a few particles, resembling chopped spinach, but only a few of these floating in a light green coloured fluid. The urine is of a dark port wine colour, and on turning it about in the vessel the colouring matter adheres to the sides. Acid does not give Pettenkofer's reaction. Could not try Masset's test. Microscopy, some blood corpuscles and epith-scales to be further examined. Bowels acted once this morning.

℞ Quinine Sulphate ℥ ss.
Acid. Sulph., dil. ℥ ss.
Tinct. Opii, ♏ xx.
Aquæ Callidæ, ℥ vj.
Mft. Enema Statim.

℞ Cataplasm Sinapis.
Reg. Lumbar, App. ut modo dict

℞ Potassæ Chloratis, ℥ j. ss.
Sodii Chlorid., ℥ j.
Sodæ Bicarb., ℥ ij.
Aquæ ad, ℥ vj.
Tr. Aurantii, ℥ j.
Mft. fiat. Capiat Coch. duo magna effervescent e.

℞ Pulv. Acid. Tart., grs. x., in
Aqua purâ, ℥ j.; solve dis. horis.

Temp. 103·2. Pulse 102. Respiration 14. Weak chicken broth and champagne. His pupils, although there is a strong light in the room, are widely dilated.

OCTOBER 30. 3 P.M.—Kept injection for 10 minutes. Rejected first dose of mixture, but kept second down, and also kept down a little

weak chicken broth. Has not slept. Urine still melanurious. Perspiring freely, and complains of weakness in consequence. To have ℥j champagne every hour.

Repeat injection and continue mixture. Temp. 102·2. Pulse 102.

7 P.M.—Has vomited three times. Bowels acted once. No pains. Skin moist and profuse perspiration. Pupils not so large as this morning. Temp. 102. Pulse 98.

Repeat injection et

℞ Quiniæ Disulph., ℈ j
Calomelanos, ℈ ss.

Fiat pil. vi. iii. statim, et iii. post horam. Has not slept. Urine still the same, about ℥iv. secreted. Pulse is much stronger than last note. To have one tablespoonful of champagne with equal quantity of water occasionally, or every 1½ hours.

℞ Nepenthe (double strength), ♏ x.
Tr. Gelsem. Fort (Ferris's), ♏ x.
Aquæ, ℥ ss.
Ft. hst. hora sumend si opus sit.

℞ Enema simplex cras primo mane sd.

OCTOBER 31ST. 8 A.M.—Vomited after the first dose of pills, but kept very well down the next. Slept very well, but had to take the stool three times during the night. Perspired freely till the early morning. No deafness or giddiness.

Since the enema bowels have acted once, stool consisting of a dark greenish liquid, very bilious. Just now his skin is cool and moist. Temp. 98·5.

Pulse 98. No pains. Has vomited once this morning, greenish red fluid. Urine still hæmaturique but much lighter in colour, like weak claret. Tongue moist. Pupils slightly contracted. Patient feels little uneasiness in throat. His conjunctiva is much clearer this morning. To have arrowroot and port wine p.r.n., as he cannot take his broth. Continue champagne in smaller doses as pulse is still far from strong.

Repeat Inj. Quinine, grs. xxx.
Tr. Opii, ♏ xx.

℞ Pil. Quiniæ, grs. iij.
iii. omni hora (mitte ix.)

1 P.M.—Has taken all the pills. Vomited after the last; is a little deaf just now. Pupils still slightly contracted. Has dozed a little, but starts. Urine still bad, deeper in colour than this morning, but not so dark. No pains anywhere. Pulse small, compressible, 98.

Temp. 99·0. Skin cool and clammy. Patient complains of weakness. Continue champagne every hour, arrowroot and port wine, weak wine and water, p.r.n. Has had only one bilious stool since last note, passed a small quantity only of urine.

5 P.M.—Temp. 99·0. Pulse 98, small and compressible. Has had two bilious stools; passed some urine, which is not so dark as last note. No pains. Skin cool and moist. Feels very weak. Has vomited once, dark green; does not like his champagne; to take it in smaller doses. Weak brandy and water occasionally, if he likes it arrowroot and port wine.

Inj. Quinine, grs. xxx.
Tr. Opii, ♏ xx. statim.

℞ Pills Quinine, grs. iij. 3 at 8 p.m.

To have a cataplasm at pit of stomach if necessary, and early to-morrow morning a simple enema if his bowels do not act twice before then.

NOVEMBER 1ST. 9 A.M.—Temp. 99.0. Pulse 86, of fair strength and volume. Slept well last night. Had two bilious stools, and in consequence the simple enema was not administered. No pains. Vomited twice during the night; latest at 2 a.m. Skin cool and moist. Complexion much fairer; feels stronger. Tongue moist, but still slightly coated in centre.

℞ Inj. Quinine, grs. xxx.
Tr. Opii, ♏ xx. statim.

Urine still melanurious, but not so dark as yesterday.

℞ Quiniæ Sulphatis, grs. xij.
Calomelanos, grs. iij.

Fiat pills iv., two to be taken at 11 a.m., two at 12 a.m.

Continue champagne. To have some port wine instead occasionally if he likes it. He does not like the brandy and water.

5 P.M.—Temp. 99·0. Skin not so cool as last note but of normal feel, moist. Patient has slept off and on and feels much stronger. Pulse fuller and stronger, 90. Has had one liquid bilious stool. Has not vomited. Urine passed in moderate quantity and is now only slightly reddish in colour. Patient has taken some chicken broth and arrowroot and port wine.

Quinine injection discontinued.

Repeat four pills as in last note, ij. at 7, ij. at 8 p.m.

NOVEMBER 2. 9 A.M.—Temp. 99·5. Pulse 90. Has not slept during

the night; took the pills and vomited once at about 10 p.m., but not since. Had one stool in the later part of the evening, but not since. His skin is warm and somewhat dry. Tongue moist. Took some arrowroot this morning, which he kept down. Still complains of pains on swallowing. Urine no longer melanurious.

℞ enema simplex c. Olei Racine, statim.

℞ Pil. Quiniæ simplicis, grs. iij, ii. omna hora.

5 P.M.—Temp. 99·0. Pulse 86. Has slept a little during the day; took six pills, after which a singing in the ears supervened; they were discontinued. Enema acted once, bringing away a lot of bilious material. Has not perspired much during the day; feels much stronger. Has not vomited since last note. His pulse is much stronger.

℞ Liq. Morphiæ Hyd., ♏ xl.
Tr. Gelsem Fort (Ferris's), ♏ x.
Aquæ ℥ iss. Hst. hora sumend si opus sit.

℞ Enema Ricini cras primo mane si antea alv. non salutus est.

To continue his pills to-morrow morning.

November 3. 9 A.M.—Patient slept off and on, but never for a long time at once. Took the draught. Has not vomited. Bowels not having acted during the night the enema was administered at 5.30 a.m. and one action of bilious matter resulted. Urine cloudy on deposition, but not highly coloured or melanurious. Tongue moist, and, except for a small patch in centre, clean. Pulse full and good strength, 76. Temp. 98·8.

No pains or aches. Has had four pills this morning. No singing in the ears. To continue two every hour till physiological action is manifest.

November 3. 5 P.M.—Temp. 98·5. Pulse 80.

After the third dose of pills, *i.e.*, 18 grs. quinine in all since this morning, he became deaf and the pills discontinued. Feels much stronger, and has been able to take his broth. No vomiting. Urine as this morning. No stool. Skin moist.

℞ Calomelanos, grs. x., hora somni.

℞ Enema simplex cras primo mane.

November 4. 9 A.M.—Slept a little during early part of the night, but not after 12 p.m. Took the powder which did not act, and an enema was administered this morning, after which there was one bilious stool. Urine now quite clear. Patient complains of headache. Temp. 98·5. Pulse 72, of normal strength. Has not vomited.

℞ Acidi Nitro-Muriatici Diluti, ℥ ij.
Liq. Strychniæ, ♏ xv.
Liq. Arsenici Hyd. P.B., ♏ xxx.
Tinct. Cinchonæ Co., ℥ iv.
Aquam ad, ℥ iv.
Fiat Mist. Cujus Capiat, ℥ j 4 tiis et modo dictim.

5 P.M.—Feels very much better. Temp. 98·5. Pulse 72. Has slept a little during the day. Bowels not acted.

℞ Haust. Cathart. cras primo mane.

November 6. 9 A.M.—Draught taken early this morning; has not acted yet.

5 P.M.—Draught has acted once.

November 7. 9 A.M.—Draught acted twice during the night. Temp. 98·5. Pulse 72. To continue.

November 8. 9 A.M.—Slept very well, but does not feel very bright this morning; the morning is very damp and depressing. Temp. 98·8. Pulse 72. Skin dry and non-perspiring.

℞ Pil. Quiniæ, grs. iij., ii. omni hora donec act. phys. manifesta est.

No pains anywhere. Bowels acted twice during the night.

5 P.M.—Took six pills. Physiological action of quinine. Temp. 98·5.

November 9. 9 A.M.—Temp. 98·5. Slept well. To continue pills every hour till physiological action is manifest.

November 10. 9 A.M.—Took six pills yesterday. Feels brighter. He is intensely anæmic and very slightly bile-tinged. Bowels regular. To take 5 grs. quinine bis. die., and the following mixture—

℞ Ferri et Quin. cit. ℥ j.
Tinct. Nucis. Vom., ♏ xl.
Liq. Arsenicalis, ℥ iss.
Tr. Calumbæ, ℥ iss.
Aquam ad, ℥ xij.
℥ j bis. die. c. cibo.

November 12.—Continues to progress; gains strength.

November 15.—Colour begins to return to the cheeks. Recommended for a trip up the mountains at Accra. To continue mixture and quinine as before. Supply for a fortnight given him.

Subsequent Notes.

Patient returned from the mountains much improved, but still not equal to much work. Would have been better had he gone to Europe. Still anæmic. Recommended to take 5 grs. quinine daily

for the next month; the dose to be at once doubled and repeated in two hours if any symptoms of malaise should appear, and continued till physiological action of quinine is fully developed.

FURTHER NOTES.

MAY, '82.—Patient has done his best to carry out my advice, but has had three attacks of fever; however, have not been very severe. Recommended for a change to Europe.

REMARKS.

The illness of this patient cannot be attributed to any of those physical or moral excesses or abuse of mercury, of which *Beranger Feraud* writes so much. The case illustrates the beneficial influence of the continuous use of quinine. For several days it was deemed necessary to push quinine daily till its subjective physiological effect became manifest.

The extreme debility and prolonged convalescence are noteworthy. I quite agree with the author quoted above, that all convalescents from "Blackwater Fever" should be invalided to some healthy temperate climate, as offering the only chance of restoration to health.

J. FARRELL EASMON, M.D., &c.

CASE OF W. T.

German. Æt. 42. Missionary General Agent. Fièvre Bilieuse Mélanurique Grave.—Death on 4th day.

PREVIOUS HISTORY.—Has been in Africa for twenty years, during which period he has only returned to Germany three times. The total length of time spent in Germany during past twenty years has been three years.

Has had bilious remittent fevers and twice this melanurious form, last attack being eight years ago, when he had to be invalided to Europe. Has lately had much work and anxiety in his duties and has gradually been failing in his health, although it is barely nine months since his return from Europe. Has had attacks of intermittent

fever lately. His bowels have been generally regular, but appetite has been deteriorating. He has taken from time to time small doses of quinine. He is a very moderate liver, of a profoundly phlegmatic temperament.

Was sufficiently well to attend church yesterday. He got up this morning early and went to superintend the watering of the garden. Seen there by one of his fellow missionaries. He was noticed to be complaining of being very weak, was recommended and went to bed. Fever rapidly supervened, and at 11 a.m. began to pass blackwater.

4 P.M.—My first visit. T. 103·5, P. 105, small and weak. Perspiring freely, vomiting from time to time, but not very frequently. Said the cold stage with marked rigors lasted from 10 a.m. to 1 p.m. Last night also had an attack of fever, cold stage lasting from 10 to 12 p.m.

His skin is very jaundiced. Conjunctiva of a lemon colour, tongue of a yellow brown. No epigastric or splenic tenderness, but the liver is tender to touch and breathing. Bowels acted twice this morning. Hands cold and clammy, but feet warm.

℞ Catapl. sinapis Epigastrio.
Mist. Sodæ Efferv. om. hora.

6 P.M.—102·5. P. 105, better volume and strength, had a few minutes sleep. No vomiting since last note.

℞ Quiniæ, grs. xxv.
Liq. Opii Sed., ♏ xv.
Acid. S. dil., ♏ xxx.
Aquæ, ℥ j. Statim (hot.)

9 P.M.—Said to have vomited half-an-hour after draught, bringing up some blood. Up to present time has vomited five times, first two and the last being with some blood. Neither soda, mixture, water or anything else will remain on the stomach now. T. 103, P. 108. Drowsy and listless, has passed water twice, total quantity ℥ viij. of a dark coffee colour. No stools since 8 a.m. Tried but did nothing. Skin still moist and perspiring. Vomits first now and brings up a few pellets of dark blood in a slightly bile-tinged mucus.

Continue Catapl. Sinapis ad epig.

Champagne and soda in teaspoonful doses, *ad lib.*

AUGUST 22. 6 A.M.—T. last night at midnight 103·5. No vomiting after midnight, but very restless before that and after. Passed ℥ xij. of urine since last note, which does not appear quite as thick as that of yesterday. Skin moist and perspiring. T. 102,

P. 100. Slept only a little during the early morning. Has had about ℥ vj. champagne during night, but without soda as he does not like it, and some beef tea. Tongue still deeply coated. Bowels have not acted. To have enema simplex at once, immediately after action of which he is to have 12 grs. quinine by mouth.

9 A.M.—Had one stool, dark green. Passed ℥ vj. urine since last note. Has not vomited. Took 12 grs. quinine at 8 a.m. and repeat it at once. Still perspiring.

11 A.M.—Began to feel restless about 10 a.m. and vomited about half-an-hour ago, and since five times. Skin dry. Passed another stool and ℥ iij. Patient looks quite exhausted. P. 105, thready. Great irritability of stomach. To have 40 grs. quinine by enema at once. Catapl. Tereb. to loins and Sinapis to pit of stomach. T. 104.

1 P.M.—Keep clyster only half-an-hour, not sick since 12 a.m. Catapl. Tereb. repeated at 11.45. T. 105, P. 105. Skin non-perspiring, very restless. Urine passed now is very dark; frothy and crimson at the edge in pot, ℥ v.; altogether ℥ viij. passed since last note. Tongue dry. Patient is deeply jaundiced. Conjunctiva mucosa deeply tinted. Repeat enema quiniæ.

4 P.M.—T. 103·8.—Full perspiration. Has not vomited. Kept clyster for an hour, and has had a stool besides; a large one containing quantity of biliary matter. Has had champagne and beef tea, all of which he retained. Is quieter. Passed some water with stools (? ℥ iij.) Slept for a short time. Pulse still very weak, 95. Repeat enema quiniæ grs. xl. in nutritive enema at once.

6 P.M.—T. 102. Kept the injection 1½ hours. Had one stool after. Repeat.

8 P.M.—T. 102. Patient asleep. Has been sleeping off and on for past two hours. Kept injection for half-an-hour and one stool since. P. much weaker, 108. Skin moist and perspiring. Patient quite calm. Repeat enema 40 grs. at 8.30 when patient wakes up.

12 P.M.—Last injection retained only a very short time. Vomiting came on again at 9.30. Has since been very restless. Vomit consists of pellets of green mucus in slightly greenish viscid liquid. Patient complains of great thirst. Tongue, dry brown. Skin non-perspiring. Complains of great heat internally. Urine ℥ iij. T. 102·5, P. 105. Had one stool after last enema. To repeat enema at 2 a.m. and

℞ Acid. Nitro-mur. Ft. ♏ xl.
Syrupi Simpl. ℥ ss.
Mft. Mist. ℥ j. et aq. cy., ℥ iij. p.r.n.

AUGUST 23. 7 A.M. Began to perspire about 2 a.m. and had the

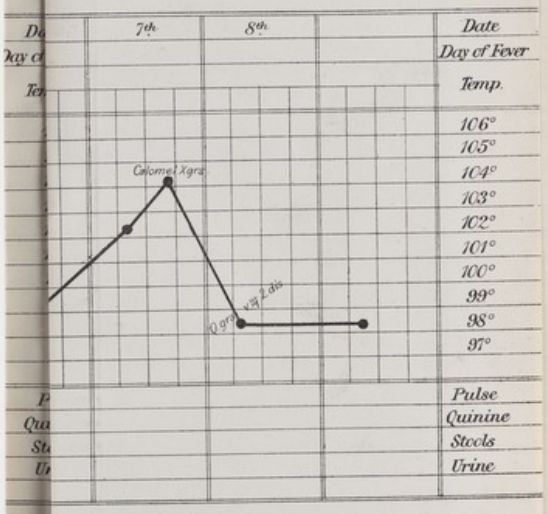
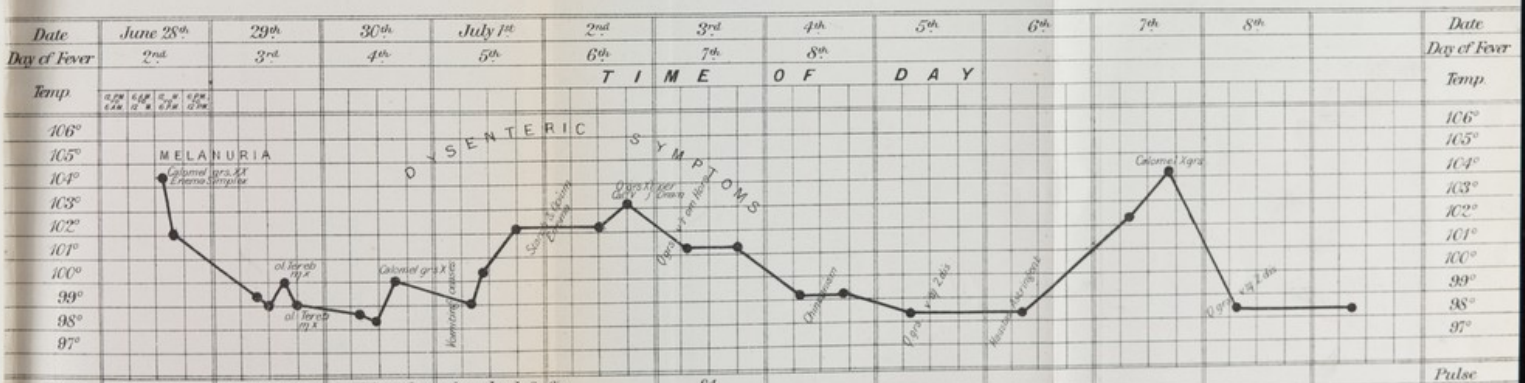


Chart No. 2.

Case of S.

German. Ætat 29.

Fiévre Biliéuse Mélanurique de moyenne de intensité.



J. Russell Reaman M.D. &c.

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				105°
				104°
				103°
				102°
				101°
				100°
				99°
				98°
				97°
P...				Pulse
Qui...	18 Grs.	18 Grs.	10 Grs.	Quinine
St...				Stools
Ur...				Urine

Raising Infl. Arsenic Mix Vomica & Columbae

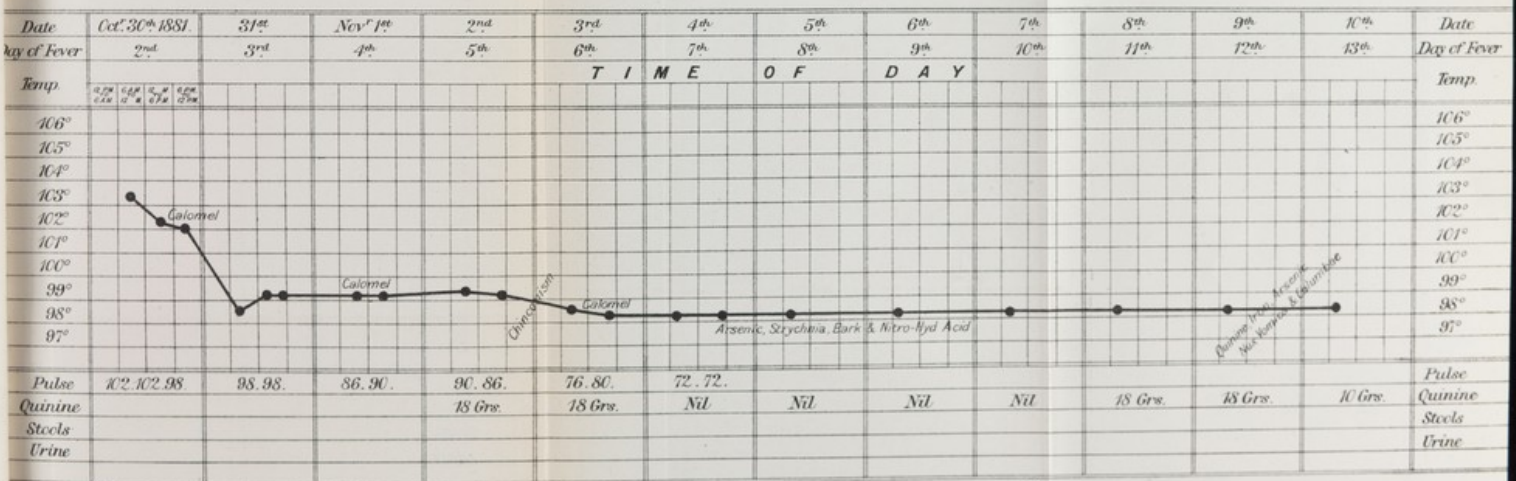
Emmell Vaccaro M.D. &c.

Chart N° 3.

Case of H.

German, Ætat 20.

Fièvre Bilieuse Mélanurique de moyenne de intensité.



J. Russell Reaman M.D. &c.

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101°					101°
100°					100°
99°					99°
98°					98°
97°					97°
Pulse					Pulse
Quinine					Quinine
Stools					Stools
Urine					Urine

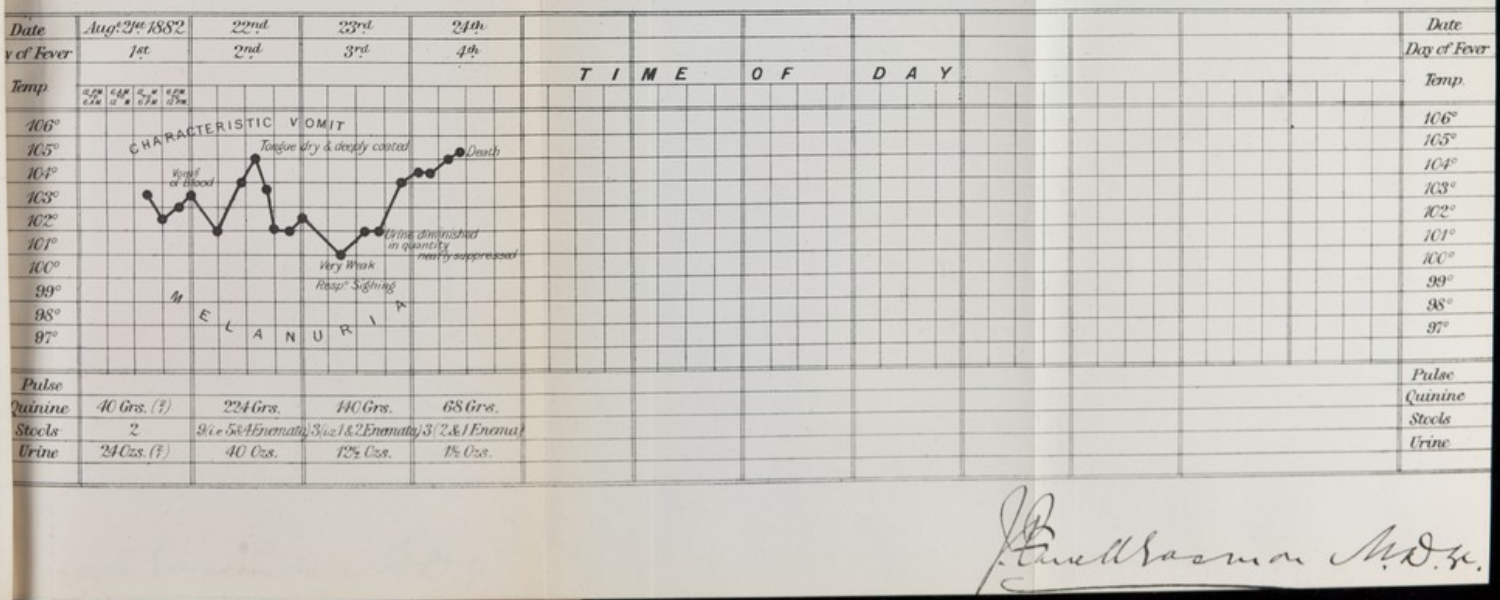
Samuel Wasman M.D. &c.

Chart N° 4.

Case of W. T.

German, Ætat 42.

Fièvre Biliéuse Mélanurique Grave.



J. Rae Brasman M.D. &c.

Attack N.º 1.

Result, Cured.

Date	
Day of Fever	
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106°	
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103°	
102°	
101°	
100°	
99°	
98°	
97°	
Pulse	
Quinine	
Stools	
Urine	

Ewell Swaim M.D.

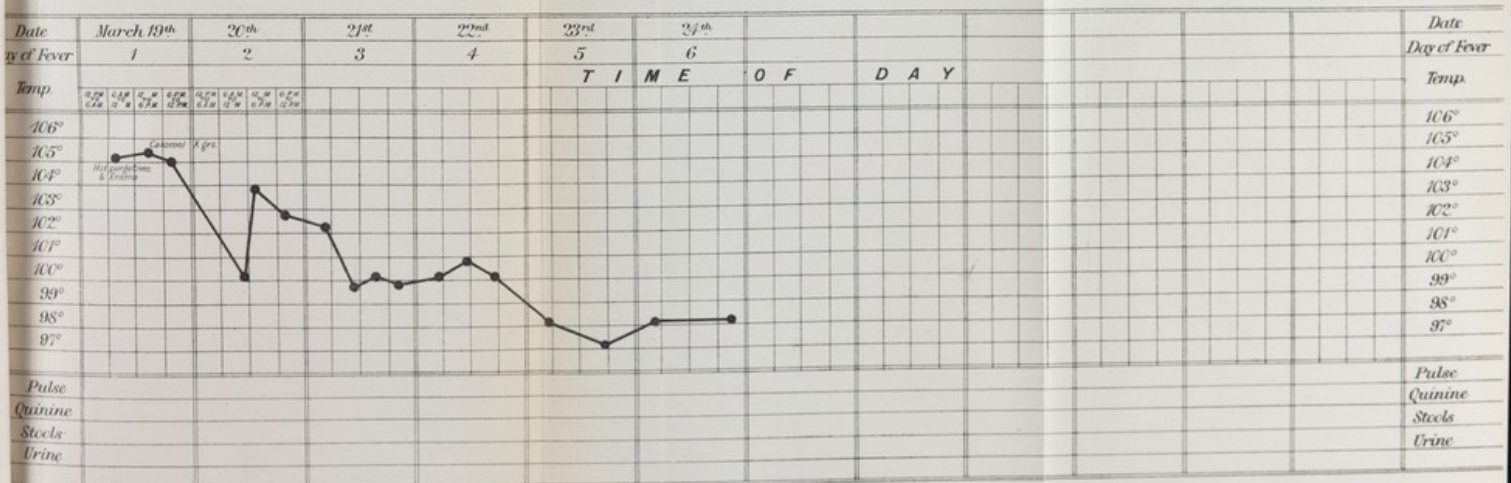
Chart N°. 5.

Case of J. L.

European. Ætat 25½

Diagnosis. *Endemic. Bilious. Remittent* *Attack N°. 1.*

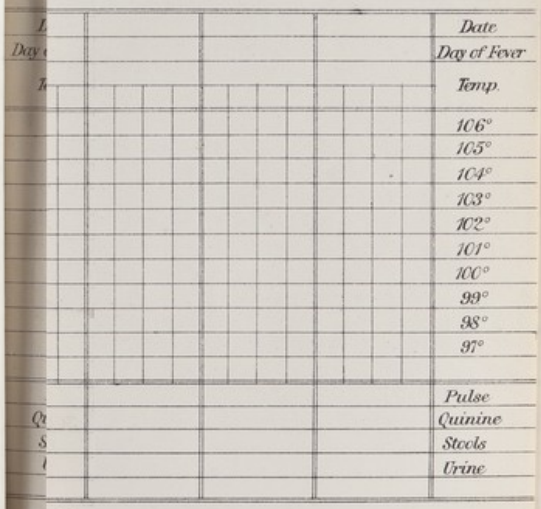
Complications. *Result, Cured.*



J. Campbell Macnamara M.D.&c.

Attack N.º 3.

Result, Cured.



Russell Sawyer M.D.

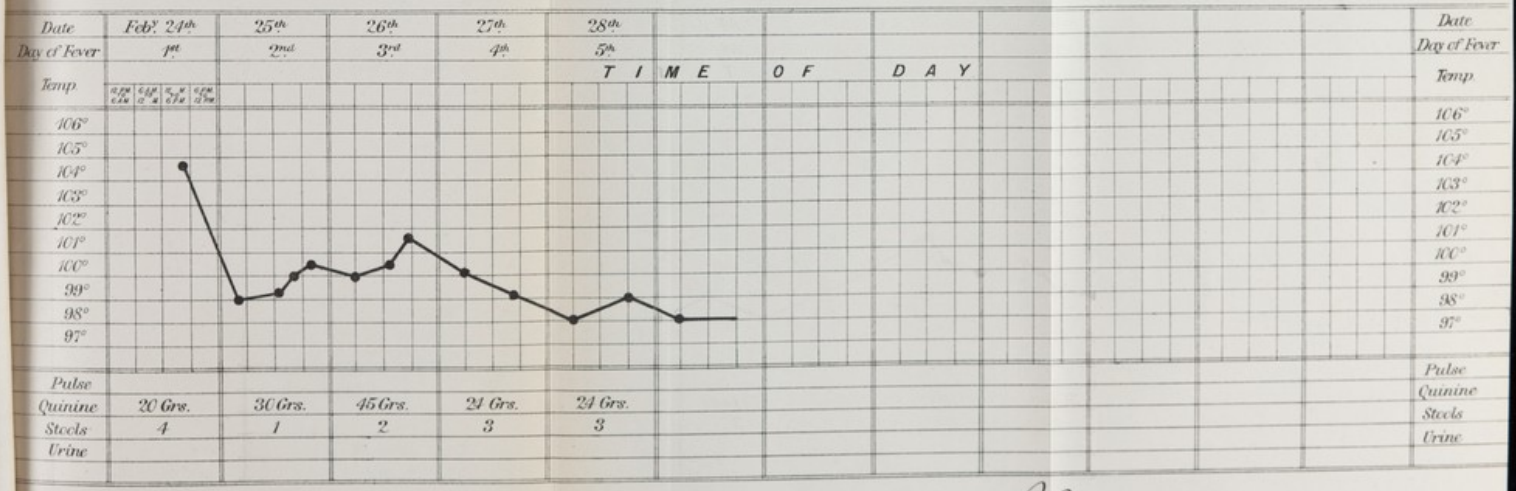
Chart N°. 6.

Case of N.

European, Ætat

Diagnosis. *Endemic. Remittent. (non Bilious.)* *Attack N°. 3.*

Complications *Effects of exposure to Sun.* *Result, Gured.*



J. Russell Reaman M.D. &c.

enema and retained it for three quarters of an hour. One stool after. Between 3 and 5 was very restless, but quieter since. Urine ℥ iij, not quite so thick or dark as in last note. Dryness of tongue persists. Respiration noticed for the first time to be short and sighing. T. 101, P. 85. Repeat enema.

10 A.M. Fast asleep. Last injection not retained long.

1 P.M.—Slept till 11 a.m., when he had an enema of quinine, which was soon rejected, followed by nutritive enema, which is retained. Passed urine twice, less dark than in last note, ℥ viij. T. 102, P. 90. Skin moist and perspiring. He takes his acid mixture by mouth, and teaspoonful doses of brandy and water or champagne from time to time. Cannot support himself in bed. Slips down. Speaks with a tremulous voice. Is only slightly deaf. To have enema quiniæ grs. xv. at 1.30, and grs. xv. at 4 p.m.

4 P.M.—Had an enema quin. at 1.30 (grs. xv.), and one just now (grs. xv.). Both retained. Bowels not acted since 1 p.m. Tongue is rather drier. P. 90, slightly irregular. T. 102. Restless. To repeat enema 2ª quaque horâ (grs. xv.). Complains of thirst. No urine since last note.

10 P.M.—Has been very restless since 7 p.m., turning from side to side. Thirst urgent. T. 104, P. 105, irregular and jerky; much feebler. Tongue drier. No stool. Water again black, ℥ iss. Nausea great, occasionally vomiting. To have brandy and water *ad lib.* Repeat injection at 12 p.m. Had two injections at 6 and 8 of grs. xv. Quiniæ.

℞ Grs. x. Calomel. Statim.

Aug. 24. 1 A.M.—Called up. Patient very weak. Pulse barely perceptible, intermittent. Hands and feet cold. T. 104·5. Tongue dry and brown. Thirst intense. The blister of last night, which was taken off at 7 a.m., before it rose, has now risen, and the serum is bloody. Tongue and head and hands tremulous. No stools. No urine.

℞—Quin. Sulph., ϑ ij.
Brandy, ℥ ij.
Olei Tereb., ℥ j.
Beef tea hot ℥ x. Ft. enema, statim.

This enema was kept for twenty minutes, when patient became less restless.

3 A.M. T. 104.5. Pulse slightly better, 1.10, jerky, tremors. Tongue still dry. Has had no sleep, and brandy and water *ad lib.* No urine, no stool.

7 A.M.—T. 105. Tongue not so dry as last night. P. fuller, 108

but compressible, and slightly irregular. Had calomel, grs. x. at 4 a.m., and enema simplex at 4·30. Enema came away, no fœcal matter. No vomiting, prostration great. Has kept down beef tea. R—Quin. Sulph. grs. xviij. in two papers at once, only one retained.

Urine $\frac{3}{3}$ iss., not so dark.

10 A.M.—T. 105·2. Prostration marked. P. small, fluttering, 120. Had and kept 10 grs. quinine at 8 a.m., and has not vomited since last note. Had two stools of very offensive dark green matter. Tongue as in last note.

12.30 P.M.—Breathing became stertorous about 11 a.m. Progressive weakness. Patient dies without anyone in the room knowing it, so quietly, five minutes ago.

Examination of Urine.

Urine passed at 6 p.m., Aug. 21.

Colour.—Dark coffee, thick, frothy, crimson at edges in pot.

Reaction.—Acid; Conjulated by heat and H N $O_3 = \frac{4}{5}$; deposits on standing = $\frac{1}{5}$, of a brownish red colour, the rest of the liquid of dark malaga or coffee colour. Gmellin's test = nil.

Microscopy.—Brownish granular detritus, epithelial scales (renal) and small epithelial casts. One or two blood corpuscles found on each slide (three examined), after careful searching. Sediment dried and treated with Sodium Chloride and strong Acetic Acid, yields crystals of Hæmatin. S. G. not observed (no instrument).

Urine passed at 6.0 a.m., Aug. 22.

Colour.—Dark port wine, not quite so thick, frothy. Acid, Albumen = $\frac{3}{4}$; Sediment = $\frac{1}{5}$; Gmellin's test = nil.

Microscopy as above.

Remarks.

The previous history, the mode of onset of characteristic symptoms, the vomiting of blood almost at the very onset, the intense melanuria and jaundice, and weakness of pulse, and the large amount of albumen in the urine, all contributed to make the prognosis a very grave one.

Quinine was pushed as far as was judged safe, but proved ineffectual. Death resulted from exhaustion.

J. FARRELL EASMON, M.D.

CASES OF DYSENTERY

TREATED BY

ENEMATA OF WARM WATER.

BY

JAMES IRVING, M. D.
ASSISTANT-SURGEON, BENGAL ARMY.

EDINBURGH:
PRINTED BY STARK AND COMPANY.
MDCCCXLVIII.

CASES OF DYSENTERY, &c.

The following cases afford examples of a practice recommended by Dr O'Beirne of Dublin, in a work published in the year 1822 ("New Views of Defæcation, &c."), and which has lately been revived in India by Assistant-Surgeon Hare, of the 7th Bengal Irregular Cavalry, in a pamphlet published during the present year ("Hints for an improved Treatment of Remittent Fever and Dysentery." Delhi, 8vo. Pp. 36.) Before relating the cases, it may be as well to detail briefly the rationale of the practice.

It is well known that in dysentery, fæcal accumulations are apt to occur at the sigmoid flexure of the colon, and at the *cæcum*, and that the lodgment of these masses, to quote the words of Annesley, tends "very evidently to irritate and inflame the mucous surface on which they lodge, and cause ulceration and even sphacelation in a very short period, if neglected or injudiciously treated." (Researches on the Diseases of India, vol. ii. p. 152.) Hence, in the treatment of the disease, purgatives have been pretty generally recommended by authors and practitioners; and various drugs of this class have been employed, many of them of an irritating description. Annesley used to prescribe twenty grains of calomel at night, and a black dose in the morning. Bampfield, another author of very varied experience in the treatment of dysentery, gave eight or twelve grains of calomel twice or thrice a day, till salivation and purgation were produced; and, to ensure a full purgative action, used also to give thirty grains of jalap, or an ounce of salts. He occasionally purged with extract of colocynth and infusion of senna. Purgatives are also recommended as an important part of the treatment, by Curtis, Wade, Ballingall, Lempriere, and Twining, all of whom saw much of the disease within the tropics; and there are few writers who do not advise the occasional use of laxatives as a part of the cure. The

difficulty commonly experienced is, to fix on the proper period for their administration, and to give such as will act effectually and mildly, without irritating the inflamed mucous membrane. For this purpose, Dr O'Beirne recommended the injection of a quantity of warm water through an elastic tube, passed above the sigmoid flexure; and he affirms that, by this means, the bowels are effectually opened, and accumulated fæces are removed, while the warm water rather soothes than irritates the inflamed membrane; and that, moreover, the effect is produced much more speedily than by purgatives given by the mouth,—only a few minutes being required. He shows that in dysentery, besides the mechanical obstruction to fæces in the twisting of the colon at the sigmoid flexure, there are other obstacles, such as, the contraction of the gut from spasm, and swelling of the inflamed membrane; while the fæcal accumulation, by impeding the circulation below it, causes further swelling, which may be to such an extent as to give rise to *prolapsus ani*.

In order to administer the enema as recommended by O'Beirne and Hare, the patient lies on his back, and the elastic tube of Reade's or Weiss's stomach-pump is passed through the anus, and carried gently onwards for about nine inches, when the end will reach the flexure; warm water, or milk and water, of the temperature of 90°, and in quantities varying from three to six pints, is then pumped into the bowels, which may be observed to become gradually distended. On withdrawing the tube, and if the patient can bear it, he should be laid on his left side, or have his belly gently rubbed and pressed. On his going to stool the injection is returned, and generally procures a free fæculent evacuation. By means of the pumping, the water is intimately mingled with any accumulations; and the tube, by being moved from side to side, or gently up and down, assists more effectually to break up hardened masses. The water, in fact, thus performs the part of those fluid secretions which the accumulations cause the intestines in cases of dysentery to throw out, and which soften and break them down, and thus procure their gradual discharge. Purgatives must act in a similar manner, by soliciting from the intestines fluid secretions, which act on scybala in a similar manner. Mr Hare observes—"By the first injection, some fæcal matter, at least, will be softened and removed, and the injection can be applied again and again, till the relieved intestine eject itself the harder matters, reduced as they must be in size, if any remain." P. 26.

In chronic dysentery, where we have either ulcers or great irritability of the colon, this remedy would seem likely to prove serviceable. It is found to be a good laxative, removes ill-digested fermenting fæces from the delicate mucous membrane; and, by means of it, the swollen or strictured gut can be gently distended

with a bland fluid, while it also affords a ready means of applying astringents to ulcers of the intestines. But in chronic dysentery this practice presents another advantage, pointed out by Mr Hare, viz. that we can sooner give tonics and generous diet, because, when the intestines are thus regularly washed out, we do not fear the presence of fermenting ill-digested food. When ulcers exist, and it is wished to employ astringent lotions, Mr Hare first washes out the intestines, and then throws up the medicated enema. Those substances from which he has derived most benefit, are fifteen grains of nitrate of silver dissolved in two pints and a half or three pints of water, a strong decoction of bark, or a mixture of catechu and chalk.

This plan is now extensively adopted in Bengal, and has been used to some extent in the Artillery Hospital at Subathoo, where I have had an opportunity of judging of its effects. In using the tube of the stomach-pump, it is advantageous to close the holes at the side of the extremity of the tube, and to bore a large aperture at the end, so that a stream of water may be directed forwards with some degree of force. It also appears to be of great importance to have the warm water as long as possible in contact with the mucous membrane, so as to foment its tender surface; hence the patient should try to retain it as long as possible. But to the enema I often add, with advantage, a few drops of laudanum and a few grains of acetate of lead, which exert an astringent as well as sedative action on inflamed parts. The good effects of this plan, as personal experience enables me to testify, are often striking. A patient who before has had frequent small stools, accompanied by pain and tenesmus, after the enema has a copious fæculent motion without tenesmus, and from this time the evacuations become less frequent, contain less blood, and by the daily repetition of the injection, with scarcely any other remedy, a cure is produced. In other cases, as those in which the liver is affected, the relief is merely temporary; and a few cases occur in which the use of the remedy seems to add to the uneasiness of the patient, to increase the frequency of the stools, and the violence of the straining. It is proper to remark, that although, as in all stations in the Himalayas at this season, bowel complaints have been common, yet no very severe case of dysentery has occurred at Subathoo; and consequently this practice has only been tried in the comparatively mild cases which have occurred. In two chronic cases, in which it was used, it proved of little avail; the administration first of a warm water enema, followed by one of nitrate of silver solution, rather adding to the discomfort of the patients; but perhaps both of them had suffered too long from chronic dysentery to admit of benefit from any remedies; and after death the colon in each was found to contain one mass of ulceration.

The following testimony, however, as to the success of this method in a case of some standing, is well worthy of notice. Surgeon Baddeley of the Artillery thus relates his own case in the 3d number of the India Register of Medical Sciences:—"Mr Hare's plan of administering hot water injections in cases of dysentery, is, I think, likely to prove a most valuable therapeutic agent in that hitherto intractable complaint. The effect of its operation in my own case was remarkable, for it produced what may be considered a cure after the third application. My disease had continued for near five months, and though at the time of my making trial of the plan, it had assumed a milder form, the motions still numbered about eight daily, and were generally mixed with bloody albuminous matter. After the third application of the hot water, the frequency of the motions was sensibly diminished, and the bloody secretion ceased, and the bowels appeared to have suddenly resumed almost entirely their healthy function. It is now nearly a month since I used the remedy, for I have continued so well ever since, that I have not thought it necessary or advisable to repeat it again. I have for the last month given the plan a further trial in hospital practice, both for Europeans and natives, and with apparently favourable results. I have likewise found decided advantage from its application in mild forms of *delirium tremens*, and the after effects of dram-drinking. The injection in these cases has always been preceded by an emetic, and the rapidity with which the debilitated nervous system is restored by this plan is most marked."

In the same Journal, Captain Richardson of the 73d Regiment, N. I. writes thus:—"My dysentery commenced June 1847, and continued uninterruptedly with great reduction of strength till January 1848, during which time I took purgative pills and laudanum, the latter daily, without any but temporary relief. I was indeed in the habit of keeping a lump of opium by my side, which I constantly used, and, from constant purging, could not venture from my house without it. In January 1848, after the arrival of my regiment at Lahore, I saw Dr Hare, who for some time treated me with a variety of medicines, according to the old routine, without the least benefit. He then recommended that I should try his new method, which he explained by lending me his book. I passed the tube without the slightest inconvenience or pain, and it brought away such an enormous stool, that I nearly fainted. I had strong purgatives previously, which quite failed to bring away this large accumulation. From that moment I felt great relief, and continued to improve in health and strength to the present time (11th February 1848), occasionally only using the injections, and am able to take active and even violent exercise."

Case 1.—The first case which I shall give is one, in which warm water enemata seemed to prove very beneficial in arresting the disease.

Sergeant D. G., aged 30, 6th Battalion, Artillery, was admitted into hospital on the 29th July with tertian fever, from which he recovered in a few days; but, on the 11th August, he complained of griping, with small frequent stools, consisting chiefly of blood and mucus. For this he took five grains of blue pill with half a grain of opium, followed next day by a dose of castor-oil, and also Dover's powder on the 12th, 13th, and 14th. But the griping, tenesmus, and small bloody stool continued. On the morning of the 15th, an enema of four pints of warm water with seven grains of acetate of lead was administered.

August 16*th.*—The enema administered yesterday brought away a full feculent stool along with several scybala; he passed no blood, and the bowels have not since been moved.

Enema to be repeated.

Vespere.—The injection brought away a large accumulation of hardened fæces. No stool since; feels quite easy.

18*th.*—The bowels were now quite natural, and he had no longer tenesmus or pain, but continued a few days longer in hospital on account of rheumatism.

Discharged 21st August.

Case 2.—Gunner H. M., aged 25, 2d Brigade, Horse Artillery, 4¾ years in India, admitted 5th August 1848, with dysentery. States on admission that he has had diarrhœa for a fortnight, and that since yesterday he has had very frequent calls to stool, with tenesmus. Has had about forty stools to-day, consisting principally of blood and slime. Tongue red on the edge; pulse 92.

Ten grains of calomel with one grain of opium were ordered to be given in the form of pill at the hour of repose. The diet to consist of sago.

August 6*th.*—Has had very frequent calls to stool during the night; stools greenish, and mixed with mucus and blood.

Two scruples of the compound jalap powder were ordered to be taken immediately; and after the interval of five hours, an enema of warm water to be administered.

Vespere.—Felt much relieved after the enema, which brought away a few scybala; stools less frequent, with less blood. Hab. enema anodyne.

7*th.*—No motion since last evening. Slept well; free from pain, but feels very weak. Pulse 84.

The enema of warm water with six grains of acetate of lead to be again administered; arrow-root for diet.

Vespere.—Only four stools since the enema this morning; a few hardened knots of fæces.

8*th.*—Four bilious stools in the night. Little or no tenesmus. Pulse 76; tongue natural; appetite good; enema to be repeated.

9*th.*—Two stools after the enema yesterday; no blood.

A draught, consisting of one ounce and a-half of the infusion of chirayta (*Gentiana Chirayta*) with four grains of bicarbonate of soda, was directed to be given three times daily.

Low chicken diet.

10*th.*—Two feculent stools yesterday, of better consistence. Continue half-chicken diet.

Vespere.—One natural stool.

12*th.*—Discharged.

Case 3.—Bombardier D. D., aged 35, 4th Battalion, Foot Artillery. Admitted into hospital under Surgeon Tritton, 25th June 1848, with dysentery; twelve years in India. State on admission:—bowels much relaxed; had about thirty stools yesterday, passed with gripings, and containing blood and mucus. Tongue white, with red edges; pulse 96; abdomen soft and tender generally, especially around the umbilicus; stools mucopurulent, with blood.

Twenty leeches were ordered to be applied to the umbilical region; and an enema, consisting of two pints and a-half of warm water, to be administered at 2 P.M.

Spoon diet.

Vespere.—Pulse 80, soft; has been much easier since taking the enema. Bowels very freely moved; stools pale, fæculent, with blood.

June 26*th.*—Pulse 96; fourteen or fifteen stools since last report, very slightly tinged with blood; griping and straining much less; thirst; no appetite.

The enema to be repeated, and to have, immediately, a draught consisting of one drachm and a-half of Rochelle salt (tartrate of potassa and soda), half a drachm of gum in powder, and half a drachm of tincture of opium and camphor in one ounce and a half of peppermint water.

27*th.*—Pulse 78; tongue red; thirst; no pain; four loose stools, fæculent, with undigested matter mixed; no griping; slept well.

Enema to be repeated. Sago diet.

Vespere.—Pulse 74; stools five or six, fæculent.

To have, at the hour of repose, four grains of blue pill and one grain of ipecacuan powder in the form of pill.

28*th.*—Pulse 74; tongue more natural; thirst nearly gone; two fæculent stools, imperfectly digested. Enema to be repeated.

29*th.*—Pulse and tongue natural; no pain; slept well; no stool since yesterday morning. Half-chicken diet.

30*th.*—One healthy evacuation; no pain or uneasiness; appetite good.

To take, twice daily, a draught consisting of one ounce and a half of the infusion of chirayta with ten drops of dilute nitric acid.

July 1*st.*—No complaint. One pint of beer.

2*d.*—Discharged.

Case 4.—Sergeant R. P., aged 30, 1st Battalion, Foot Artillery. Admitted 3d August 1848, with dysentery. States that he has had diarrhœa above a fortnight; but latterly his stools have been very numerous (twenty yesterday), and he has been passing blood and slime with much tenesmus. Slight pain over the cæcum; skin hot; tongue white.

To have, at the hour of repose, a pill consisting of ten grains of calomel, one grain of ipecacuan, and one grain of opium; after the lapse of four hours, half an ounce of castor-oil; and in the evening to have ten leeches applied over the right iliac region. One drachm of laudanum with six grains of acetate of lead in two ounces of cold water to be administered in the form of enema.

August 4*th.*—Less tenderness over the cæcum; pulse 84, small; fifteen stools in the night, fæculent, bilious, with much blood and mucus. Tongue moist; great thirst; tenesmus.

To have an enema of three pints of warm water; six grains of ipecacuan powder with five grains of mercury and chalk to be given immediately; and in the evening, six grains of Dover's powder with three grains of mercury and chalk.

5*th.*—Felt much relieved yesterday after the enema, which he retained for ten minutes, and afterwards having a fæculent easy motion. Had a bad night; twenty stools; tenesmus; motions fæculent, mixed with blood and mucus; tongue furred.

Enema of warm water to be repeated; six grains of ipecacuan with three of extract of hyoscyamus to be taken immediately, and repeated after an interval of six hours.

Vespere.—Feels easier after the enema; always vomits after taking ipecacuan in any form or dose; considerable tenesmus. An anodyne enema to be administered.

6*th.*—Had a better night; two stools, freer and more natural. Sago diet.

To have immediately two scruples of compound jalap powder.

Vespere.—Seven stools during the last three hours; consist of fæces with mucus and blood passed, with tenesmus.

An enema of two pints and a-half of warm water to be administered with forty minims of laudanum and four grains of acetate of lead.

7th.—Three stools after the enema; no pain; very slight tenesmus; stools more fæculent, with a mere trace of blood; pulse of better strength.

To take two scruples of the compound rhubarb powder, and, after the interval of six hours, the enema with laudanum and acetate of lead to be repeated.

8th.—Two small fæculent stools in the night; no tenesmus nor pain; no blood. He retained the enema half an hour yesterday, and felt much better afterwards.

The enema with four pints of warm water, forty minims of laudanum, and six grains of acetate of lead, to be repeated. Low chicken diet.

9th.—Three natural fæculent motions free from blood after the enema yesterday. Two stools in the night; bilious, fæculent, streaked with blood.

To have three times daily a draught consisting of two ounces of infusion of chirayta and five grains of carbonate of soda. The enema to be repeated.

10th.—One stool after the enema; one ill-digested stool in the night.

To have immediately one drachm of the compound rhubarb powder. The draught to be continued. Half chicken diet.

12th.—Nearly well; bowels are becoming regular. The draught to be continued.

14th.—One natural stool this morning; feels better than he has done for four months past; gains strength. The draught to be continued.

16th.—Discharged.

Case 5.—Gunner C. H., 6th Battalion, Foot Artillery, aged 30; two years five months in India. Admitted 20th August 1848. States that he has had looseness of the bowels for a week past, and has latterly passed nothing but small, white, slimy stools, with much tenesmus. Complains of tenderness in the course of the colon, but chiefly at the cæcum. Great thirst; no appetite. Has been at stool several times in an hour all yesterday and last night. Tongue dry in the mornings, now moist and red; pulse 88.

To have immediately an enema consisting of four pints of warm water with eight grains of acetate of lead and forty minims of laudanum. Spoon diet.

Vespere.—Felt much relief after the enema; stools since fæculent; less tenesmus. Enema to be repeated.

August 21*st.*—Four stools since the enema of last night, greenish, mixed with fæces; no blood or tenesmus; slight tenderness over the sigmoid flexure.

The enema to be repeated, with the addition of four ounces of infusion of ipecacuan. Milk diet.

Vespere.—Two stools before, and four since, the enema; a quantity of fæces came away; nearly free from pain in the sigmoid flexure; no tenesmus.

22d.—Twelve pale-yellow fæculent stools in the night; no pain nor griping; pulse 80.

To have immediately five grains of blue pill and one grain of opium.

23d.—Two stools yesterday; two in the night; bilious.

To have one drachm of the compound rhubarb powder. Low chicken diet.

24th.—Half diet.

27th.—Discharged.

Allusion having been made to various diets, I may briefly state that a man on half-diet gets eight ounces of mutton, one pound of bread, butter, tea, and four ounces of rice, besides various condiments and spices. The only difference in half-chicken diet is that the patient gets chicken instead of mutton. A man on low diet is allowed the soup from either eight ounces of mutton or a chicken, eight ounces bread, with tea, spices, &c. Milk diet is composed of one pound of bread, two pints of milk, butter, and six ounces of rice. Spoon diet consists of eight ounces of bread, or four ounces of sago, tea, and rice-water.

Subathoo, 29th August 1848.

MALTA FEVER:

ITS CAUSES, PATHOLOGY, AND TREATMENT.

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MDCCCLXXVI.

ON MALTA FEVER.

THIS disease formed the subject of an instructive paper by Mr Oswald G. Wood, M.B., in the *Edinburgh Medical Journal* for July last. His narrative is especially interesting as a record of the fever, as he suffered from it himself; nevertheless, as this fever appears under various forms and assumes different degrees of intensity, a short account of it by one who had an opportunity of seeing it in its island home may not be unwelcome.

Synonyms.—Simple continued fever, gastric fever, febricula, Malta fever, ephemeral or Mediterranean fever, remittent fever, bilious remittent fever, enteric or typhoid fever, gastro-bilious fever, infantile remittent fever, typho-malarial fever. These are the principal synonyms in use; many others may be added, but they will be found to be modifications of the foregoing. It is difficult to adopt a term to distinguish this disease, as it is extremely hard to select any one feature which is constant in every case. My own observation would lead me to class it under the head of typho-malarial fever, for reasons to be stated hereafter.

I fully endorse Mr Wood's suggestion that a distinct name should be given to this disease, and there can be none better than the one he recommends, and by which it has been so long known, namely, "Malta fever." While advocating this, it must not be inferred from it that I believe this disease to be alone confined to Malta. Of this I am extremely doubtful; but my own experience does not allow me to say more. Suffice it for our present purpose to know that it is endemic in the island, and that it is one of the most distressing complaints a physician is called on to treat there.

The island of Malta lies nearly in the centre of the Mediterranean and almost within sight of Sicily. Although certain winds —the scirocco wind blowing from the south-east,—are occasionally

uncomfortable, their inconvenience has been, I think, somewhat exaggerated. The surface of the island is undulating, and does not present any hills higher than 600 feet above the level of the sea. There are neither woods nor marshes, and the orange and lemon plantations are enclosed within garden-walls. The thermometer does not vary more than four or five degrees during the twenty-four hours from the end of September to the middle of May. The heat of summer is intense, unobstructed as it is by hills and woods or indeed vegetation of any sort. The civil population in 1874 = 145,599, and the usual peace garrison = 6000 to 7000.

Valetta is the chief town, with narrow streets and high houses, the streets crossing each other at right angles. The town is built on alluvium, with thick sandstone below, and beneath this the lower limestone (Parkes). The drainage is extremely bad, the sewers are "nothing but long cesspools," and, from the porous nature of the stone, the ground is in many places reeking with filth. I have seen a drain cut into the rock several feet deep, and the ground was saturated like a sponge with sewage filth, the rock disintegrated and foul to a degree.

Causes.—Youth may perhaps be considered the first predisposing cause; those who have reached thirty-five and upwards appear to suffer less; after this, season may take its place: but the real causes of this fever are to be found in the local conditions of drainage, aided, perhaps, by the moisture present in the air. In the hot summer months, the air is very stagnant, and loaded with fœtid organic matter given out from the rock.

During my service in 1872, one of the worst outbreaks of this disease took place in Fort Ricasoli, where the system of drainage was known to be imperfect, and which was otherwise placed in as favourable a position as regards sanitation as possible, being at the entrance of the Grand Harbour, and far removed from the town. The smell pervading the place was at times sickening; this arose from the system adopted of hand-flushing of the water-closets, which was not properly carried out, the result being the accumulation of soil in the sewer.

The Maltese are an exceedingly dirty race; they are very poor, and their diet is scanty and unwholesome. Meat they seldom touch, and wine only on feast days. They eat the coarsest description of food, bad bread, and disgusting fish. Their personal habits are offensive to a degree; they have little notion of decency, and every by-lane and corner is the receptacle for excreta, which dries rapidly, or possibly ferments, to be washed into the harbour, in which the water is stagnant, or pulverized and scattered with showers of dust all through the place. The condition of such a state of things, under the influence of a semi-tropical sun, can be more easily imagined than described.

Mr Wood states that cases occur out of Valetta and Cottonera;

in other words, away from the immediate haunts of filth. Such, undoubtedly, is the case. But are not these exceptional cases? Does not experience tell us that even Selema is healthy compared with Valetta? and I cannot call to mind one case in Fort Manoel during the time I resided there. To sum up, then, this disease may be stated to be essentially a filth disease, intensified by the climate and moisture present in the air. The climate in summer is almost tropical, and, as a result, we find our soldiers suffering from the effects of tropical heat; they become weak and debilitated, and dyspepsia prevails. Languor pervades all classes, and the appetite lessens; in fact, the constitution is lowered to a great extent, and this is evidenced by well-marked anæmia. New-comers appear to be more liable to be attacked, and suffer more severely, than those who have been long on the island; while those who have had ague previously, suffer, I think, most, though this latter disease can hardly be said to prevail to any extent. That malaria does exist in Malta, I think there can be no doubt. It does not require the miasma from a marsh to produce on the constitution fevers of a malarious type, and certainly there are factors sufficient at Malta to explain the occurrence of these diseases, which, though so closely allied to the agues, are by many classed under a distinct head. The character of the season, the amount of watery vapour present, the temperature, the aërial movements of the atmosphere, the evaporation going on from the porous sandstone rock, saturated as it is with sewage; surely these are sufficient to produce malaria, complicated as it unhappily is with enteric fever, each complicating the other, and masking the individuality of the separate diseases, sometimes the one, sometimes the other predominating, until we have such a wide nomenclature, that we are sorely puzzled under what head to give it a place.

As to the water supply being the cause, I must state, paradoxical as it may appear, the water supply in Malta is very good. I made over fifty analyses, and only in one instance had I any reason to find fault; these investigations were undertaken at all times, and under all conditions, and I have had only the same result to report. Under these circumstances, I think, I may fairly dismiss this as being the cause, except under some special case. The graphic description of this island by Mr Wood I can fully confirm. My experience leads me to believe that exposure to the sun is too often quoted as a predisposing cause. Better far have men actively employed, if provided with proper dress, than lounging in heated casemates, or passing their time between the canteen or miserable gin-shop and their bed. I well remember the intense heat that prevailed during the summer of 1868 at Quebec. The men of the Royal Engineers were at work during the whole day in trenches, with no shade whatsoever, and not a single bad result followed. The curse of life at Malta is the *ennui* which is

present, and if more time was passed in the open air, I am satisfied we should hear less of the unhealthiness of the climate. The cause then of this disease is, I maintain, a preventable one. It essentially consists in defective drainage, in having to sleep in houses and breathe air impregnated with fœtid organic vapours given off from saturated subsoil or filthy water-closets, aided by climatic conditions, which makes enteric fever in Malta assume a malarial type, and which would, under similar conditions in England, simply produce typhoid fever.

Symptoms.—These in the early stage are rather obscure. The attack is preceded generally by dyspepsia, languor, headache, a feeling of chilliness with great weakness, accompanied often with muscular pains in the preliminary stage. These symptoms are usually followed by a sharp rigor, with well-marked gastric derangement, and with tenderness, often very acute, in the epigastric region. In the more severe forms intense frontal headache prevailed, bilious vomiting and jaundice were present, with enlargement and tenderness over the spleen; when this was severe the temperature curve rose rapidly. There was an extraordinary feeling of restlessness present, and this was mostly associated with insomnia. Often in place of sleeplessness there was profound slumber, but this unfortunately brought with it no relief; it was in the strictest sense "unrefreshing sleep." As a rule, in the early stage there was no diarrhœa, and no chest complication, but there are many exceptions to this. Sometimes the stools are dark and hard, often loose and pale; they may be almost dysenteric in their character, but, unless in very severe cases, such is not seen until the close of the fever. I have found tenderness and gurgling over the iliac region present in nearly every case: perhaps this is the most constant symptom. There is seldom any pain or tenderness over the hepatic region, nor does the liver appear to be enlarged—in my experience it can seldom be felt, even when looked for carefully. The spleen is always enlarged, and exquisitely tender on the least pressure.

I have never seen any exanthem on the skin, except on one occasion, when I distinctly recognised rose-coloured spots near the umbilicus. The skin varies, sometimes hot, sometimes cool; the thermometer seldom records a high temperature in the early stage, and in this, as Professor Maclean points out, exists one of the peculiarities of this disease, that the temperature curve differs widely from true malarial fever, and that some days elapse before it attains its maximum, which appears to be 104° to 105°, and this is maintained for a lengthened period. The duration of the premonitory stage is very uncertain; often days pass, and the only symptom is the distressing *dyspepsia*, accompanied with intensly acid eructations, from which the patient suffers. He tells you he is feeling "aguish," and of this he is convinced, because he "perspired freely last night and feels better." The pulse ranges from 84 to 90, seldom

higher; the tongue is coated white, with red edges, and papillæ prominent at the base; it is large, and flat, and flabby, and sometimes marked with the impress of the teeth; as the disease advances, it becomes dry and cracked; the tonsils are often enlarged and swollen. There may be nausea, but vomiting in the early stage is uncommon, and betokens a severe attack; there is ever present a sense of fulness about the stomach, often most distressing; there is little appetite, perhaps in some measure to be accounted for by the pain which is felt in the epigastrium three or four hours after taking any food; the gums are spongy and inclined to bleed; the palate is at times coated with an aphthous deposit, but there does not appear to be any inclination for this to spread. I said, as a rule, the bowels at first are constipated, particularly in the mild cases, but I have seen many exceptions to this; they are very irregular, often confined, as often the patient suffers from diarrhœa, sometimes dark or loose with mucus, always very offensive. The face and expression were truly characteristic—pale, anæmic, weary, often jaundiced slightly, and with a most despondent manner—betokening the severe nature of the poison and its effect on the nervous centres. The average daily quantity of urine passed was between fifteen and twenty-five ounces; it was either neutral or very slightly acid when passed, but quickly became alkaline afterwards. There was usually a deposit of phosphates and lithates, but no albumen, unless in cases of pre-existing kidney disease, when it may appear and disappear in the urine. The presence of bile was not uncommon. I saw two cases in which it was present in large quantities. The specific gravity was normal. In one case, a gunner in the Royal Artillery, there was suppression of urine for fifty hours, and when he passed water it was loaded with bile; on this man I noticed distinct purpuric spots. During the period of suppression of urine the bowels also became confined, though previously he had had diarrhœa almost dysenteric in its character. This man ultimately made an excellent recovery. The heart-sounds were at times weak, and an anæmic bruit was prolonged into the carotid vessels. Delirium was, as a rule, absent, and in my experience confined to the more severe cases; when it appeared, generally before death took place, it was mostly of a low muttering character, and associated with partial sleep. Insomnia is sometimes exceedingly troublesome, mingled with an irritability of manner most distressing; often, instead of sleeplessness, there was deep slumber, but even this brought with it no sense of rest. Such is a general description of this disease, which varies so much in some of its symptoms as to make it difficult to describe. These symptoms last generally from ten to twenty-five days, during which time the patient gradually grows weaker and weaker. The progress of the disease is slow, one might almost say monotonous, with, in almost every instance, progressive exhaustion.

It is about the end of the second, or commencement of the third week, that, when it does occur, evidences of congestion of the lungs become apparent, slight bronchial murmurs passing with rapid strides into congestion, and this again into pneumonia. Sometimes single, often double, it appears limited in most cases to the base of the lung, though in one case I remember the whole lung became rapidly the seat of pneumonia, which proved speedily fatal. Local complications, such as pneumonia and pleurisy, occur only in severe cases, and are due, no doubt, to blood-poisoning, and these subside as this latter becomes eliminated. In the majority of cases, the disease runs on an unchequered course for days, nay weeks, presenting few, if any, characteristic appearances, save from day to day the unfortunate patient grows weaker, emaciates, and becomes more anæmic. Occasional remissions not unfrequently occur, ill-defined and ill-developed, and these are more marked in the hopefulness of the patient, who is depressed to a degree, than to either fall in temperature or pulse, or any diagnostic sign of any value. The external air and temperature augment or lessen his sufferings. Moist winds, and especially the scirocco wind, aggravate, while dry and cold winds act favourably; indeed, winter weather is hailed in Malta as the great benefactor in such cases. To give a definite description of this disease is almost impossible. Mild cases may be so slight as hardly to compel the patient to remain in bed for more than a few days, during which time he may appear to be suffering from a severe attack of dyspepsia; and this is the one peculiarity of these mild cases, that they are always accompanied by this most intractable form of dyspepsia, oftentimes lasting for months, while the more severe cases pass into the bilious type, with all the distressing sequelæ, prolonging convalescence almost indefinitely. Gastric derangement appears to be an invariable sequela of this disease. Associated with this is a well-marked anæmia, slow and progressive.

Convalescent Stage.—It is in the convalescent stage that the English physician first comes to treat this disease, and here he will recognise what Professor Maclean states to be the most notable part of the fever, namely, its extraordinary duration, extending not unfrequently over seventy days before anything approaching convalescence is established. Can we assign any reason for this? May not the enlarged and congested spleen—which, in my experience, is always present, and which acts as a diverticulum for the blood—may it not have stored up within it blood affording pabulum for the germ of the fever, keeping up, as it were, a storehouse of nutrition, dealing it slowly out, to be consumed day by day at the expense of the unfortunate sufferer, thus prolonging the disease over a lengthened period, and which would have expended itself far sooner had there been no such condition of things? I simply offer the suggestion for what it is worth. In one case

the thermometer registered 104° after sixty-five days, and nearly six weeks afterwards the patient entered the distressing stage of rheumatism and neuralgic pain, through which the majority have to pass before convalescence. This temperature curve is maintained for a long time, with the "unavoidable result of wasting and degeneration of the muscular tissue, and prostration."

As I have before observed, the symptoms vary in each case, sometimes the malarial, sometimes the enteric predominating; but there is one more constant than any other; I allude to the rheumatic stage. This stage is not reached until the more urgent febrile symptoms have subsided. The patient is progressing slowly, we hope making a fairly good recovery, when a sudden rise in temperature takes place, and the distressing pain announces the onset of a rheumatic or neuralgic attack. Mr Wood states the soles of the feet are more frequently attacked. My experience teaches me there is no rule; sometimes these pains are muscular, sometimes articular, as often both. The extremities appear to be most frequently affected, and I think, perhaps, the ankle-joint by preference. Another form the rheumatic sequela may take is orchitis. I have seen three such cases. The tissues swell up, after a few hours of pain, to a considerable size. There was slight effusion into the tunica vaginalis in one case; when the rheumatic affection assumes this form, it is exceedingly troublesome.

Intercostal pain is also a sequela very distressing, and associated with this there may be palpitation, with excited action of the heart, but no bruit. I may here add, that I never saw peri- or endo-carditis in this disease. The rheumatic stage may last for weeks, and Mr Wood tells us in this stage he noticed remissions; that there was a distinct remission in the morning, followed by an exacerbation of fever in the afternoon. This is exactly what I observed, when the enteric fever has, so to speak, exhausted itself, when, in fact, the patient is convalescent from this fever, *per se*, then the character of the true malarial fever shows itself, so as to leave us in no doubt of its precise nature; and I maintain that in this stage quinine will prove useful if prescribed in one large and full dose at night.

I met with one case in which there was the most acute cutaneous hyperæsthesia, but it only lasted one day, and passed off as rapidly as it appeared. It is in this stage, too, that the disease, if it does not prove fatal, has a tendency to develop phthisis in weakly and scrofulous subjects, the result, no doubt, of the debilitating effects of this disease on an enfeebled constitution. The effect of such an attack cannot but leave traces behind it; the nervous system suffers, but very much more with officers than men. It is very seldom that the former recover without feeling some effect, such as a partial loss of memory and inability to work, a lassitude and weariness, uncontrollable and almost intolerable. Weak, nervous, and irritable, he performs his daily task with no

comfort, and less pleasure. This does not appear to be the same with the men; in fact, delirium and insomnia is a much more constant symptom in the acute stage among the officers than men.

Treatment.—In the treatment of this disease, the first element for consideration, in order to effect a speedy recovery, is air—fresh air, pure, and, if possible, cool; it is also the best preventive.

The therapeutic treatment is simple. Stimulants are badly borne and mischievous in the early stage of the disease; but better far are saline and diaphoretic febrifuges, which are very useful and grateful to the patient, the regulation of the bowels by the mildest of aperients, and this only when absolutely necessary, and the exhibition of a full dose of opium at night; this must be withheld, or given with caution, in the premonitory stage. In the most earnest manner would I deprecate the use of stimulants in the early stages of this fever. The diet should be extremely light, food only of the simplest and blandest description being admissible. Milk, if it can be procured fresh from the cow, is grateful, mixed with lime-water or soda-water and ice. Good milk is difficult to be had in Malta, and goat's milk is no substitute for cow's milk; it can never be tolerated, and seems to increase sickness, if this be present. Beef-tea and chicken-jelly, flavoured with a little lemon, should be given in very small quantities, and repeated as often as necessary. Lemon-juice in water with ice as a drink is exceedi[illegible]efreshing. When vomiting is troublesome, sinapisms o[illegible]e epigastrium, hot fomentations, and bran poultices are useful. I have also found a hypodermic injection of morphia prove beneficial, when other remedies failed. In the early state, quinine is useless, and invariably disagrees with the patient, while in every case the mineral acids are exceedingly badly borne.

In the later and convalescent stage, quinine has a decided advantage, if given in one large and full dose at night, checking the perspirations, and giving tone to the debilitated system. Fruit is very grateful, and may be prescribed with advantage, especially the juice of the prickly pear. All stimulants, whether by high diet or alcohol, are bad; the stomach will not tolerate them; weak claret or champagne and soda-water are the most useful. Alkalies agree remarkably well in every stage; indeed, lemon-juice appears to be the only acid tolerated, and with water makes an excellent drink. When the bowels are loaded, a dose of calomel with ipecacuanha is very useful, and the action may be assisted by the use of an enema of warm water. When vomiting is severe, ice, to dissolve in the mouth, should be allowed, with small quantities of champagne and soda-water. Blisters answer well in the articular affection, and if pain be very severe they may be dressed with morphia; belladonna and chloroform have both proved valuable adjuncts when employed locally. For diarrhœa when the ordinary vegetable astringents have proved useless

there is no remedy, in my opinion, we possess equal to the sulphate of copper given in pill. Alum, catechu, tannic acid, are of comparatively little value in the treatment of Malta fever. An enema of starch and opium is of great value in stopping irritability; and if these cannot be retained, we may use suppositories of morphia. If haemorrhage is severe, small and often-repeated doses of turpentine are exceedingly useful; and if this fails, we cannot do better than fall back on the liquor ferri perchloridi in repeated doses. I would earnestly recommend the continued use of the astringent, whatever it may be, for at least one week after the excreta becomes solid, and to urge the greatest caution in administering any aperient; when this is absolutely necessary, only castor-oil is admissible. In the more chronic stage, cod-liver oil, iodide of potassium, and quinine are especial favourites, and have a wonderful controlling power, shortening the duration of the disease, and restoring to health the unfortunate sufferer. Professor Maclean has suggested the use of small doses of ipecacuanha as a blood depurant in the early stages; Mr Wood is apprehensive lest the gastric irritability may prevent its employment. I have no experience; only to add, that lately I have known, on the authority of an excellent physician in London, that he has found drop doses of the wine of ipecacuanha given every hour a most invaluable remedy in the nausea following pregnancy. I mention this, as I think Dr Maclean's suggestion a valuable one, and the fact of nausea being present[illegible]t to be no deterrent to its use.

There is one suggestion I would offer, and that is, that the patient should be told of the necessity of eating slowly, and masticating his food properly. The giving or withholding of stimulants will depend on the individual case; if the pulse fail in force and bulk day by day, we are bound to increase them, always using them in as diluted a form as it is possible to do.

Morbid Anatomy.—The pathological appearances usually met with are those of congestion and softening of the enteric mucous membrane, and with ulceration and congestion of Peyer's patches; these latter are certainly more prominent than usual; the mesenteric glands were frequently, indeed almost always, enlarged, swollen, and soft. The cæcum and large intestine, including the rectum, is always deeply congested, and frequently the seat of ulcers. In one case, that of a private in the 18th Royal Irish Regiment, so well marked was the ulceration of Peyer's patches, that it would be impossible to err in establishing the nature of this disease, in every pathological appearance was it so distinctive of enteric fever, though this case presented a typical one of Maltese fever throughout, and at no stage was there diarrhœa which could not be checked by the simplest astringents.

The spleen was severely congested in every case; in fatal cases it was found to be soft and friable, and of a very dark and purplish colour.

The lungs, as surmised, are congested generally at the base; and where pleurisy or pneumonia existed, the pathological characters incident to these diseases were present.

The liver is sometimes enlarged, but, as in the case of soldiers this gland suffers more or less independently of this fever, I can give no very definite account of its condition; as far as this disease is concerned, it does not appear to affect it much.

The muscular tissues are exceedingly liable to degeneration, and it is some time before they recover; they become very soft and flabby.

The kidneys do not seem to be affected, excepting in the case of pre-existing disease. On considering the nature of this disease, its duration, long convalescence, marked diarrhœa in the majority of cases, and abdominal symptoms characterizing typhoid, with the pathological appearances invariably present, will, I think, fairly establish it to the name I have ventured to describe it under "typho-malarial fever," and which has already been applied to it by no less an authority than Professor Maclean.

That it has long existed is evident to any one who will study the history of this fever. It appears to have been especially prevalent in Her Majesty's Royal Navy half a century ago, for, on turning to the medical history for that period, we find that "Rheumatism was common, and often extremely intractable," and "two-thirds of all the invalids were classed under the head of 'inflammation with fever,'" a vague term, I acknowledge, but one easily understood by any one who has studied the disease.

In conclusion, I would most earnestly express my belief in the *hybrid* character of this fever, partaking as it does both of the enteric and malarial character; and I am satisfied that, by careful watching, no physician will fail to distinguish symptoms which, though often perhaps puzzling, will satisfy him of the nature of this malady, and give him the first stepping-stone to the treatment—preventive or otherwise—he should adopt.

I know there are many shortcomings in this paper, which no one regrets more than the writer; but if I have in the smallest degree assisted in giving a description of this disease, as seen in its own home, it will amply repay any trouble.

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To
Professor Longmore
with the Author's
Compliments

Hyanebaugh
Bengal.
24th Jany 72.

ENTERIC FEVER IN BENGAL.

By J. B. Hannah, M.D., and Thomas O'Farrell, M.A., M.D.
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(Re-published from the Indian Medical Gazette.)

The subject of this paper was suggested by a study of the statistical returns of fevers in the Bengal Presidency from 1864 to 1868 inclusive, as given in the Army Medical Reports of those years. It will be seen by the accompanying table, that, in the year 1864, the number of cases of enteric fever throughout the

Year	1864		1865		1866		1867		1868	
Strength ...	39,936		37,631		35,446		34,237		32,909	
Disease.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
Febris remittens	1,643	59	1,903	62	1,014	38	911	29	1,314	33
Febris typhodes ...	9	5	13	8	14	3	16	6	70	49
Febris continua	2,662	26	3,907	42	3,308	36	2,647	23	3,254	27

whole of the Bengal Presidency, with a strength of European soldiers amounting to 39,936, was only *nine*: a trifling increase of one or two in each year has taken place up to the year sixty-eight, when there is a sudden rise from *sixteen* in 1867 to 70 admissions in 1868, forty of which proved fatal. As the disease does not appear to have been epidemic in any locality, it is but reasonable to suppose either that this form of fever is on the increase, or—what is more probable—that in former years it was frequently confounded with, and returned under the head of, continued or remittent fever. Enteric or typhoid fever is said and generally acknowledged to be due to a specific poison,

fostered and disseminated by the presence in the atmosphere of decomposing animal and vegetable matter, and is usually to be found in its greatest intensity, where a faulty hygienic condition and defective removal of excreta exist.

In India, owing to the nature of the climate, the want of sanitary arrangements so common in large bazars and native cities, the badly-selected sites and faulty drainage of many old cantonments, the frequency with which in former times barracks were overcrowded, the carelessness exhibited in disposing of human excreta—probably thus causing contamination of drinking water by a foul surface drainage,—would lead one to expect that this disease would have been of more frequent occurrence, both formerly and even at the present time.

The immunity, however, which the British soldier seems to enjoy in India from enteric fever, is very remarkable when we consider that during the greater period of his service, he is of an age when all the intestinal glands are in their highest state of activity.

It is most important to determine beyond a doubt whether this immunity is not more apparent than real, and that typhoid fever may exist to a greater extent than is recognized or shewn by returns.

The inspection of the above table points to this conclusion on the following grounds:—

Firstly.—That we find the mortality as high as 57·1 per cent., or only surpassed in severity by malignant cholera. Now as a large proportion of typhoid fever cases recover (about one death in five cases), it is only reasonable to suppose that the whole 70 cases must have been of a severe and well-marked character, and that no inconsiderable number of latent or less marked cases have been classified under other heads.

Secondly.—Though the sanitary arrangements of cities and cantonments have been immensely improved within the last few years, yet we find in 1868, with a far smaller number of European troops, that there is an enormous increase of enteric fever—thus leading one to infer either that careful conservancy or good sanitation have little influence in preventing the development and spread of the disease, or that formerly in the milder cases it has not been fully recognized and returned as such.

That there is considerable difficulty in arriving at a correct

diagnosis between enteric fever and some of the severe varieties of the paroxysmal and continued fevers of this country, there is no doubt. A remittent fever may be so severe as to have no appreciable remission, and to distinguish the exacerbations and remissions of some cases from the well-known periodicity of typhoid, is by no means an easy task. At the outset, both diseases may be characterized by similar symptoms:—there is languor, feebleness, head-ache, heat of skin, with looseness of the bowels, and perhaps vomiting; as the disease progresses, delirium, brown tongue, and abdominal gurgling may be met with in both forms. True, there are two apparently diagnostic signs in typhoid, namely, "rose spots" and "yellow diarrhœa," but when we remember that the spots may be so few as almost to escape detection even in England, and that Europeans (especially in illness) in this country are liable to such a variety of eruptions—marks of insect bites, &c., the difficulty is considerably increased; and again, that typhoid fever may prove fatal without any diarrhœa is a well-known fact (Skoda, Aitken). The circumstances that lesions of the intestines are said not to be uncommon in many cases diagnosed during life as remittents, and that enlarged spleen is a peculiarity of enteric fever, tend to exaggerate this difficulty even after death.

When we consider the immense tract of country, and the extremely varied character of climate and soils occupied by the European troops, it is not to be wondered that great confusion exists as to the causation and course of Indian fevers. The bad habit formerly so common of naming them after the localities in which they occurred, has certainly not assisted in elucidating their character.

The determining of the precise character of these fevers is plainly of the greatest practical importance, not only to the physician as a guide to treatment, but more especially to those who have charge of the health of large communities as in the case of our armies and jails. It must be remembered that neither true remittent nor simple continued fever is contagious, or likely to spread by human intercourse, and consequently that there is no necessity for using chemical agents to destroy discharges or disinfect the bed or body line. But, on the other hand, enteric fever is held by no less an authority than Dr. William Budd to be communicable by its evacuations and by human

intercourse, and chemical agents are useful and necessary both for the purpose of checking its spread and preventing its recurrence.

Notwithstanding the apparent rarity of the disease as shown by the Medical Department blue books, we wish to prove from the appended cases, that enteric fever has affected this regiment at least, to no inconsiderable extent, since its arrival in the country.

On the 8th November, 1870, the 63rd Regiment landed in Bombay, and proceeded by rail to Deolalie; although composed of a large number of growing boys under twenty years of age, and of inferior physique, they were in a good state of health, and had been so during the voyage. Having remained a short time at Deolalie, the regiment was despatched by rail to Barrackur, *en route* to Hazareebaugh. At the former place, they were detained for some days, receiving over camp equipage, carriage, &c. The vicinity of the camp was in a very unsanitary condition on account of the large number of native followers, who had been detained there for more than a week; the drinking water, too, was very impure.

Shortly afterwards, a woman was admitted into the camp hospital, with fever of a severe continued type, accompanied by vomiting, which was followed by diarrhœa. There was tenderness and gurgling in the right iliac region, with a dry brown tongue and restless delirium; hæmorrhage from the bowels took place several times, and the stools were of a typhoid character. No eruption was observed. The peculiar diarrhœa continued for a considerable period, and her convalescence was very protracted.

Knowing how unusual enteric fever is considered to be in India, this was returned, though with doubt, as a case of remittent.

Six days afterwards, another woman was brought under treatment for pyrexia, and was soon admitted into hospital. She became extremely prostrated, with cold extremities and hot trunk, feeble pulse, sordes on the teeth and brown tongue. In this instance there was severe diarrhœa, which, like the last, had the distinctive characters of typhoid. Dull heavy delirium was present throughout. There was gurgling and pain in the right iliac region, and at times considerable tympanites. She was in

an extremely precarious condition, and about the 23rd day of the disease, had a severe relapse. She was discharged 38 days after admission, doing well, though extremely feeble. This was also returned as remittent fever.

The next case was one of great interest, as there was an opportunity for *post-mortem* examination.

Private B——, aged 19, was admitted 20th December, after two days' pyrexia; he had rigors and loss of appetite, with a white furred tongue; no diarrhœa. On the 21st, he was considerably worse; had severe fever since the 20th, without remission; he complained of pain in the head, with great thirst. On the 22nd, or the fifth day of the disease, was still suffering from great fever, bowels constipated; towards evening, slight delirium set in, with dulness of expression. On the 23rd, or sixth day, there was violent vomiting early in the morning, accompanied by diarrhœa, not, however, of a severe character; there was sordes on the lips and teeth; towards evening subsultus tendinum was noted; he gradually sank and died at 1 a.m. on the 24th December.

Post-mortem.—Brain.—Membranes and substance very much congested, veins of the choroid plexus filled with blood, venous system throughout greatly distended.

Thorax.—Heart healthy, a large fibrinous clot in the pulmonary artery.

Lungs.—Great congestion of the lung substance both anteriorly and posteriorly.

Abdomen.—Stomach.—Slightly congested towards the cardiac end.

Liver.—Enlarged, friable, and very much congested.

Kidneys.—Both congested and enlarged.

Spleen.—Intensely congested, normal in size, and presented a peculiar marbled appearance.

Glands of the mesentery very much enlarged, some about the size of a pigeon's egg; they were filled with friable fatty-like matter.

Intestines.—At the commencement of the jejunum, there were a number of small miliary white deposits, apparently in the solitary glands. These little nodules increased in size and number towards the end of the ileum, where they became as large as a pea. None of these showed signs of ulceration, until the

cœcum was searched, where several well-defined ulcers were seen. Peyer's patches showed an immense amount of deposit, each patch being raised above the surface the $\frac{1}{20}$th of an inch. Small vascular points of commencing ulceration were distinctly visible. In the large intestine, the glandular structures were equally enlarged, and the nodules were so closely packed as to become almost confluent; this state extended to the anus; ulceration of this deposit was more advanced. The mucous membrane was intensely congested, and also showed an appearance of commencing ulceration.

In this case, death had taken place in the stage of "infarction" of the intestinal solitary lenticular glands, and the agminated glands of Peyer, and, without doubt, it was a case of intensely severe typhoid fever. The whole of the mesenteric glands were enormously enlarged at the cœcum; several of the engorged intestinal glands had progressed towards ulceration. Had the man lived a little longer, there seems reason to believe that uncontrollable diarrhœa would have set in: this symptom was, however, until shortly before death, quite absent.

Following this case, exhibiting the well-marked anatomical lesions of typhoid, four men were admitted in rapid succession, *viz.*:—Private P——, D——, R——, and D——. All these cases displayed the characteristic typhoid symptoms, *viz.*, great mental and physical depression, delirium, brown tongue and sordes. Private P—— had in addition irritation of the mucous membrane of the fauces and bronchi, pain in the abdomen and right iliac fossa, with a copious eruption. This case was, however, characterized by great delirium and absence of any marked diarrhœa. In the next case, that of Private D——, there was gurgling, abdominal pain, severe yellow-ochre coloured diarrhœa, with several times great hæmorrhage from the bowels. The fever in this instance, as in the last, was accompanied by irritation of the throat and bronchial tubes, but to a much greater degree. No spots were noticed during the whole course of this case; he was 41 days in hospital, had a long and feeble convalescence, and, ultimately, was sent to the hills. Both the other cases, though tolerably mild, had marked yellow diarrhœa, and an eruption of the enteric character, but there was no throat nor lung complication; one was 28 days in hospital, and the other 36; both were discharged to attend as convalescents.

The next case is one of unusual interest, inasmuch as the man died in the 6th week of the fever, the *post-mortem* examination verifying the diagnosis formed during life. Private N——, aged 18, was admitted on the 16th December; he had been suffering from diarrhœa and fever for some two or three days previously; he was, on admission, in a highly feverish state with furred tongue, but the diarrhœa had ceased; he gradually got worse. On the 23rd, he was very weak, and suffering from considerable irritation of the throat: on the day but one following, he had cough, griping pains in the abdomen, bilious vomiting and diarrhœa.

27*th*.—He is dull, and had heavy sordes on the lips and gums, abdominal tenderness, with characteristic enteric diarrhœa.

28*th*.—No change for the better; diarrhœa continues; his breath has a cadaverous odour; tongue very brown and dry, no rose spots visible.

29*th*.—Delirium all night; a distinct eruption of rose-coloured spots on the belly and chest; these were raised above the surface and disappeared on pressure: they were unmistakeably of the enteric character.

31*st*.—Some of the spots fading, and other new ones appearing in different situations,—diarrhœa still characteristic and persistent.

3*rd January*.—No improvement; the face was swollen, rose spots still present.

7*th January*.—Very bad: throat symptoms worse, face still continues swollen, bowels only moved three or four times in the 24 hours; stools are fluid and of a brownish yellow colour. Up to the 15th there was no particular change to be remarked, no fresh spots have appeared for the last few days, and the old ones have all faded; on this date, the diarrhœa was of the peculiar yellow colour, his tongue was covered with dirty half purulent scales, he was extremely low, constantly moaning and delirious. No improvement took place; he gradually sank, and died on the 25th January.

Autopsy.

Body.—Emaciated.

Head.—A good deal of blood inside the calvarium, congestion of the choroid plexus, a little fluid in the ventricles.

Thorax.—Trachea filled with a whitish fluid; vocal chords healthy; a spot of ulceration on the anterior internal surface of the trachea; œsophagus healthy.

Heart—Right side contains a small quantity of fluid blood; a large white fibrinous clot, plugs up the pulmonary artery.

Lungs.—Adhesions over both sides; this is more marked on the left side and posteriorly. Intense congestion of the posterior border of each lung, in which situation the lung substance is very friable.

Abdomen.—Liver healthy, gall bladder distended.

Spleen.—Not enlarged, but very friable; pancreas enlarged, and very hard; kidneys healthy.

Intestines.—Stomach.—Slight congestion at the pyloric end; *small intestines* dark exteriorly, mesenteric glands enlarged; intestines filled with a yellowish fluid matter, and generally congested; about 4 feet from the cœcum, ulceration in Peyer's patches begins; this increases in severity, and on nearing the valve, the whole of the patches are a mass of ulceration. The ulcers are elliptical, with raised excavated edges, and are quite thin in some places. The solitary glands are also ulcerated. The large intestines are distended with flatus. There are a number of small circular ulcers for some distance down the gut, the greater number being near the valve. These are in different stages of ulceration.

Case VII.—Serjeant E——, age 25, admitted 10th January, 1871. The following is a short abstract of his case, which was carefully recorded daily:—

Throughout the course of the disease, there was continued fever with great prostration, delirium, yellow enteric diarrhœa, with the peculiar bran-like particles suspended in it, gurgling and pain in the right iliac region, and considerable irritation of the fauces and bronchial tubes. On the 9th day of the fever, there was an eruption of rose-coloured spots on the abdomen and chest; they were succeeded by fresh crops every three or four days, until the 29th day of the disease, or three weeks after their first appearance. They were well marked and decided. There was considerable hæmorrhage from the bowels on two or three occasions. The tongue during the course of the disease was generally brown and dry. He was 71 days in hospital.

Case VIII.—Private C——, aged 22, was admitted on the 11th January, with fever, considerable prostration, gurgling and pain in the right iliac region, and severe yellow diarrhœa. On the 8th day of the fever, there was an eruption of rose-coloured spots; he was 59 days in hospital, and was subsequently sent to the hills.

Case IX.—Private J. H——, aged 23, was admitted on the 17th February, having had pyrexia for four days; there was pain and gurgling in the abdomen, but no diarrhœa. On the 20th, there was an eruption of rose-coloured spots, and on the following day diarrhœa of a typhoid character set in, accompanied with delirium and brown tongue; fresh crops of spots appeared for some days. The disease was mild throughout, and he was discharged after 56 days in hospital. It may be remarked that this man had been in constant attendance on case VII until the beginning of his illness.

Case X.—Private P M——. Although this man suffered from severe continued fever, accompanied by purging of a typhoid character, with pain in the right iliac region, restless delirium, and a dry brown tongue, yet the presence of the eruption was not sufficiently well marked to warrant the positive diagnosis that it was a case of enteric fever, although we have no doubt that such was the fact. His convalescence commenced about the 22nd day of the disease; he gained strength very slowly, and was 69 days in hospital.

Case XI. Private G. P——, aged 19 years, was admitted on the 16th April, as a case of simple continued fever; notes were not taken of it until the 25th, or nine days after admission. At that time, he was in the following condition:—great pyrexia, tongue dry and brown, pain and gurgling in the right iliac region, with diarrhœa; there was also irritation of the fauces and bronchial tubes. As the fever progressed, the abdomen became tympanitic, the tongue perfectly black, as if covered with ink, and ulcerated down the raphe. Thirteen days after admission, there were some rose-coloured spots over the abdomen and thorax, restless delirium, constantly endeavouring to leave his bed; the purging was considerable, and the stools were of a black colour and fluid, and this, in a few days, changed to a brownish yellow; deafness and delirium increased, and were followed by strong convulsions, complete insensibility and stertorous breathing;

this state continued for about an hour, when the convulsions ceased, but he remained moribund for 24 hours, and died twenty-two days after admission.

Post-mortem examination six hours after death.

Rigor mortis set in.

Head.—Some blood inside the calvarium; marked congestion of the cerebral vessels: on section, the puncta vasculosa very numerous and distinct; about two drachms of straw-coloured fluid in each ventricle; choroid plexus very much congested.

Lungs.—Highly congested, adhesions on the left side.

Heart.—Great deposit of fat, otherwise tolerably healthy.

Spleen.—Friable, very black, weighing 8 oz.

Kidneys.—Both congested.

Abdomen.—Stomach and large intestines distended with flatus.

Small intestines.—In the last two feet there were about ten ulcers; they were small, round, and opposite the attachment of the mesentery, none were elliptical, and there was no ulceration of Peyer's patches. The remainder of the small intestines was healthy but thin.

Large intestines—The solitary glands were enlarged and closed. There was one ulcer close to the ileo-cæcal valve, circular in shape, and about the size of a large pea.

Month.		April.					May.				
Date ...		...	26	27	28	29	30	1	2		
Day of disease		...	13	14	15	16	17	18	19		
Temperature.	M.				102·1	100·3	101·1	101·2	100		
	E.				102	103·1	102·1	100·2	...		
Pulse.	M.				88	80	85	76	72		
	E.				80	80	74	80			
Respirations.	M.				28	28	20	28	20		
	E.				28	26	28	28			

Case XII.—Serjeant W——, aged 25, admitted 31st May; had been complaining of pyrexial symptoms for two days past; his tongue was covered with a brown fur; pulse 120; considerable diarrhœa, stools of a yellow ochreous appearance. There is gurgling and pain in the right iliac region. On the evening of the 5th June, or the eighth day of the fever, "rose spots" were visible over the abdomen and back, which were carefully marked; pain and gurgling still continued in the right iliac region; the tongue is very brown; diarrhœa continues, and stools present the same appearance as in last report.

8th June.—The "rose spots" above mentioned are nearly faded, but a few fresh ones are visible; symptoms as before still present, with considerable diarrhœa and delirium.

No particular change took place beyond the appearance of a few fresh rose spots, and the fading of old ones, until the 18th or 19th day of the disease, when he began to improve, and with the exception of diarrhœa, which was very persistent, he progressed steadily, but slowly, towards health. He was 37 days in hospital, and was discharged to attend, which he did for nearly a month. One peculiarity of this case was loss of sensation in the feet, which continued for about 20 days after discharge.

Month.		June.										
Date.		6	7	8	9	10	11	12	13	14	15	16
Day of disease.		9	10	11	12	13	14	15	16	17	18	19
Temperature	Morn.	...	102·2	102	100	99·4	100·2	99·3	98·2	98·3	100·2	98·2
	Even.	101	101	103	103·3	100·2	101	101	101	99·4	100·4	99·3
Pulse ...	Morn.	...	102	100	96	84	84	84	70	72	80	88
	Even.	94	100	100	98	86	86	80	90	78	84	70
Respiration...	Morn.	...	23	26	26	24	22	22	20	21	23	20
	Even.	20	24	24	26	25	24	20	26	22	23	22

Month.		June.—(Continued.)												
Date.		17	18	19	20	21	22	23	24	25	26	27	28	29 30
Day of disease.		20	21	22	23	24	25	26	27	28	29	30	31	32 33
Temperature	Morn.	98	99·1	99·2	100	99·2	97·3	99·1	98·2	99·3	99·4	97·3	97	98 97
	Even.	99·1	102·1	99·4	103	100	99·2	100·2	100	101·2	99·1	99	98·2	98 99
Pulse ...	Morn.	70	72	78	90	88	78	80	78	80	76	74	80	76 74
	Even.	72	90	80	94	90	79	82	80	88	83	80	84	80 76
Respiration...	Morn.	21	20	23	24	22	20	22	22	20	19	20	19	20 18
	Even.	23	20	24	28	25	22	26	27	22	24	25	20	21 20

CASE XIII.—Private B——, admitted 9th June, having had two days' pyrexia; at present he complains of great thirst and headache; he has a coated white tongue, quick pulse and hot skin. On the 8th day of the fever, he was much worse; had a tendency to diarrhœa, with flatulent distension of the abdomen; his trunk and head were covered with sudamina, but no rose spots could be detected; he was heavy and delirious at night. On the 11th day, the tongue was glazed and covered in places with small white patches; the rose spots appeared, but were not very distinct; his body was very thickly covered with sudamina. The stools were of a typhoid character, brownish yellow in color, and fluid; he was eight times purged in the 24 hours. On the following day, bronchitic rales were audible all over the chest. He had cough; purging still continues, of a similar character.

On the 15th day, he had restless delirium during the night; there was gurgling and pain in the right iliac region; characteristic diarrhœa; his tongue was red and glazed, having small white patches scattered over it. This state continued up to the 23rd day of the disease; since then he gradually improved, and is still under treatment. No albumen existed in his urine when examined on the 28th day.

MONTH.		JUNE.										
DATE.		10	11	12	13	14	15	16	17	18	19	20
Day of disease.		4	5	6	7	8	9	10	11	12	13	14
Temp.	M.	101·1	100·4	100·1	99·2	100·2	100·2	100·3	100·3	101·1	102·1	...
	E.	103·2	103·2	101·3	101·4	102·2	102·2	101	102·2	102·1	102·4	...
Pulse	M.	94	90	90	100	84	100	110	108	120	123	...
	E.	100	102	96	100	90	100	104	110	108	130	121
Resp.	M.	26	28	26	26	28	30	36	30	40	40	36
	E.	28	30	28	28	30	28	36	34	38	42	...

MONTH.		JUNE.—*(Continued.)*										JULY
DATE.		21	22	23	24	25	26	27	28	29	30	1
Date of disease.		15	16	17	18	19	20	21	22	23	24	25
Temp.	M.	103·3	102	102·3	101·4	103·4	102·1	100·1	102·1	102·4	101·2	101·4
	E.	105·1	103·4	103·1	103·1	103·2	103	103·1	102·1	101·4	101	99·4
Pulse.	M.	132	128	120	122	120	120	118	112	120	116	112
	E.	128	124	122	126	122	120	118	120	114	112	104
Resp.	M.	44	40	42	42	40	46	38	40	40	36	48
	E.	44	46	44	44	46	46	38	34	40	39	40

CASE XIV.—Private B——, aged 23 years, admitted 23rd June, having had pyrexia for three days previously; at present he has a hot skin, quick pulse, tongue covered with a white fur, bowels very loose, stools being fluid and of a yellow ochrous color; there was no eruption on the body. On the 25th June, in addition to the above symptoms, there was a good deal of bronchial irritation, great tenderness in the right iliac region, and the diarrhœa continued. He remained in this state until the 29th, or about the 10th day of the disease, when there was an eruption of "rose-coloured" spots over the abdomen and back. The tongue became brown; there was sordes on the teeth and gums; the diarrhœa became worse, colour of stools bright yellow and fluid. The following day a few fresh spots appeared, but all the other symptoms became modified, except the diarrhœa, which lasted several days longer; the colour of the stools changing from a bright yellow to a dirty yellowish brown. Successive rose spots appeared up to the 20th, or 23rd day of the fever. On the 25th day of the fever, although suffering from diarrhœa and great feebleness, he became convalescent. He is still in hospital, and regains strength, but slowly.

MONTH.		JULY.						
DATE.		1	2	3	4	5	6	7
Day of disease.		12	13	14	15	16	17	18
Temperature	Morning	102·2	101·4	101	100·2	101·4	100	100·1
	Evening	103	103·2	101·2	101	101·2	102·3	102
Pulse	Morning	100	98	90	97	100	100	96
	Evening	114	118	100	100	98	108	99
Respiration	Morning	30	26	25	23	40	36	...
	Evening	41	41	36	36	39	42	...

MONTH.		JULY.—*(Continued.)*					
DATE.		8	9	10	11	12	13
Day of disease.		19	20	21	22	23	24
Temperature	Morning	98·2	98·1	98·2	99	97·3	98·2
	Evening	101·1	99·1	100	100·3	99·2	...
Pulse	Morning	...	...	...	...	...	...
	Evening	...	...	...	...	...	...
Respiration	Morning	...	...	...	...	...	...
	Evening	...	...	...	...	...	...

Case XV.—Private D. G——, admitted 27th June. As this case proved fatal, it is given at some length. On admission, he states that he had feverish symptoms, accompanied by diarrhœa, for four days previously. At present, he has a hot skin, furred tongue, gurgling and pain on pressure in the right iliac region; diarrhœa, no eruption was visible over any part of the body; he remained in this state, having a dusky countenance up to the 30th June, or 7 days from the out-set of disease, when he became delirious and was very restless during the night; there was an eruption of rose spots over the abdomen and back; his stools were fluid and of a yellow-brown colour. On the 2nd July, or the 9th day of the disease, he was in the following condition:—tongue white and rough, great thirst, restless delirium, slight pain in the head, the purging is excessive, motions of a thin brown watery character, with yellow bran-like particles suspended in them, and he vomited several times during the night. 3rd July, or 10th day from the accession of the fever,—restless, delirium still continues; has been constantly endeavouring to leave his bed; the tongue is rough, and white; purging decreased, but the stools are still fluid and similar in character to those yesterday described; he complains greatly of pain in the temples. There is a tendency to meteorism. On the 4th, the delirium increased, there was great insomnia in spite of every remedy; stools of a bright yellow color; pain in the abdomen increased.

On the 5th and 6th, delirium still continued both day and night; purging of a similar character.

July 8th.—There is great abdominal pain; is unable to protrude his tongue; sometimes almost insensible, and at other times violently delirious; urine free from albumen: sp. gr. 1006, acid in re-action, scanty and passed with difficulty. Stools of a yellow-brown colour.

July 10th.—He has a dry brown tongue, with white edges; stools of a golden yellow colour; intense meteorism supervened, requiring the long rectal tube to relieve it. There was great restless delirium during the night, requiring constant care to prevent him leaving his bed; no improvement took place on the 11th and 12th, meteorism recurred frequently; he passed his stools in bed, was incessantly throwing off and picking at his bed clothes, until he became comatose, and died on the morning of the 14th June, or the 22nd day of the fever.

Post-mortem examination 8 hours after death.

Head.—Great congestion of the membranes and brain substance, with some serum in the lateral ventricles.

Lungs.—Lining membrane of trachea and bronchi intensely congested, which, gradually, increased as the tubes became smaller.

Congestion of the posterior portion of both lungs, apex of right lung congested, bronchial tubes filled with bloody serum, no trace of tubercular deposit. Bronchial glands very much enlarged.

Heart.—Liver and pancreas normal.

Abdomen.—There were slight adhesions of the omentum generally. Mesenteric glands enlarged, intensely congested and of a dark colour on section. The kidneys were intensely congested, and weighed—right 7 oz., and the left 8 oz.

Intestines.—The general appearance of the peritoneal surface in the upper portion healthy; in the ileum, there is a good deal of discoloration and vascular congestion of the vessels of the sub-mucous tissue. The chains of glands along the mesenteric attachment are very much enlarged, dark coloured and congested.

On opening the gut, the stomach is found tolerably healthy in appearance; the intestinal canal is filled with a quantity of thin, bright yellow-coloured fluid matter. The mucous lining of the canal is healthy, until the first of Peyer's patches is reached: this is raised slightly with deposit, and congested. This condition of the agminated glands exists in all the patches, but gradually increases until ulceration begins about five feet from the cœcum. From this downwards every patch is ulcerated, the ulcers having raised, well-defined edges. In some, ulceration has advanced to such an extent that the peritoneal coat shines through. The ulcers are about $1\frac{1}{2}$ inches long by $\frac{1}{3}$ inch broad; they are situated opposite the mesentery in the long diameter of the gut. A great number of the solitary glands are also ulcerated, they are circular in shape, about $\frac{1}{4}$th of an inch in diameter, with thickened edges; there are other solitary glands which are filled with deposit, but not quite advanced to the stage of ulceration.

Large intestine.—The solitary lenticular glands are filled with deposit, presenting in the centre of each a fine black point.

Except a few close to the cæcum, none are ulcerated. These ulcers were precisely similar to the small ulcers in the ileum.

MONTH.		JULY.					
DATE.		2	3	4	5	6	7
Day of disease.		10	11	12	13	14	15
Temperature ...	Morning ...	102·1	104·2	102·1	102·2	102·3	102·2
	Evening ...	103·4	103	103	102·3	102·4	103·1
Pulse ...	Morning ...	105	140	108	102	110	105
	Evening ...	120	104	112	118	120	112
Respiration ...	Morning ...	40	34	34	38	46	...
	Evening ...	50	40	36	42	48	...

MONTH.		JULY.—*(Continued.)*					
DATE.		8	9	10	11	12	13
Day of disease.		16	17	18	19	20	21
Temperature ...	Morning ...	102·3	100·1	99·4	99·3	100	101
	Evening ...	101	102	100·2	101	101·2	102
Pulse ...	Morning ...	...	102	114	108	102	120
	Evening ...	...	126	...	126	...	140
Respiration ...	Morning ...	...	...	...	...	...	...
	Evening ...	...	...	...	...	...	...

CASE XVI.—Private J. L——, aged 22, admitted July 7th, 1871 complaining of pyrexia for the last three days. At present, he has headache, hot skin, gurgling in the right iliac region, no diarrhœa, great thirst, tongue dry and coated; evening temperature 103·2; pulse 116.

8*th*.—Restless, and did not sleep; pain on pressure in right iliac region.

9*th*.—Tongue brown down the centre; bowels have been opened thrice during the past 24 hours; stools of brown colour and fluid; there is still great insomnia, and he has a dull appearance; so far he has not been delirious. His bowels were not opened on the 10th, 11th or 12th; during that period there was pain in the right iliac fossa; body bathed in perspiration; skin covered with sudamina and prickly heat; tongue brown and dry; no improvement in the general symptoms.

13*th*.—Bowels moved three times. Dejecta consisting of a quantity of dark blood; pain still in the iliac fossa. Extreme restlessness, but no delirium.

15*th*.—Much weaker this morning; a small quantity of clotted blood passed from the bowels; restless, and had no sleep last night; perspires most profusely; tongue white and moist; some bronchial irritation commencing; urine sp. gr. 1022; acid re-action, and no albumen.

Vespere.—His bowels have been opened once, and stools consisted of scybalæ and fluid blood: this was repeated during the night, but the quantity of blood was larger; restlessness still continues; tongue brown and dry.

17*th and* 18*th*.—No change; bowels have not been moved since; there was great thirst, sleeplessness, and restless delirium.

19*th*.—During the night diarrhœa began again; he was twice at the stool; dejecta of a peculiar, violet colour, and fluid, with bran-like particles suspended through them; urine, sp. gr. 1026; no albumen.

20*th*; *or* 17*th day of the fever*.—There were two or three rose-coloured spots on the abdomen; these might have existed at an earlier period, but from the outset of the disease, the skin has been so affected with prickly heat and sudamina, as to render their presence difficult to satisfactorily determine. The bowels were moved only once; stools consisted of scybalæ, and a quantity of dark coffee-coloured fluid, having the appearance of altered blood; no pain or gurgling in the iliac region; pulse 108. On the following day, there were three or four fresh suspicious-looking spots over abdomen. Bowels opened once during the night; stools a dirty brownish yellow colour, semi-consistent, with a quantity of fluid similar to the day previous. Severe aphthous ulceration of the fauces.

22*nd*.—Tongue brown and dry; throat better; sp. gr. of urine 1024; no albumen. There was no change, until the 24th, when very severe diarrhœa set in; stools of a bright yellow colour, with bran-like particles; great gurgling in the right iliac region, but no particular pain except on considerable pressure; tongue moist and covered with white patches; extreme restlessness during the night.

25*th*.—No diarrhœa; had a fair night; tongue brown and glazed; gurgling, but no pain in the iliac fossa; throat and cough still troublesome.

26th.—Restlessness still continues; three well-marked rose spots on abdomen; a good deal of bronchial irritation and some meteorism are present.

27th.—Tongue red, with white patches; bowels moved three times; stools of a greenish yellow colour, and semi-consistent. From the 30th, or the 27th day of the disease, he began to improve, and on the 3rd August, an injection of olive oil brought away a large quantity of yellowish-white, clay-coloured fœcal matter. On the 12th, his temperature was less than normal in the morning, but over 100 at night. His appetite is much improved; sleeps well, and is able to sit up.

Diurnal Temperatures in the Case of Pte. Jones L——, (Case No. XVI.)

Date.	Hours—P.M.												Hours—A.M.						
	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	12	4	5	6	7
July 18th ...	100·4	102·1	102·3	103	103·1	102·2	103·2	103	103	103·1	103·2	103·3							101·2	102
,, 19th ...	102·1	102·1	101·1	102·3	103·1	103·4	103·3	103·1												
,, 24th ...		101·3	102	102·1	101·2	104	103·2	103	102·2	102·2	101·4	103	103			102·1			101·2	
,, 27th ...	102·1		102·4		102·2		101·1		101·2			103				104·2		100		
,, 28th ...		100			101·4					102·4			103·1			101·2		101·4		102·2
,, 29th ...						101·3				103·1					102·3	100·4		100·2		
,, 30th ...					101·3					103·2					103·			101·1		
,, 31st ...					100·4		100			103						102·3		101·3		
August 1st ...	100·				99·1				102·4				102·1					101·4		
,, 2nd ...					101				103·2				103·1				102·2			99·4
,, 3rd ...					100·4					102·			102				100·2			100
,, 4th ...					102·2					102·3			101·4					101·4		
,, 6th ...	101·1				102·1					102·2			102·4					100·4		101
,, 6th ...					103·1					101·2			101						100·1	
,, 7th ...					100·4				102·1				101·2						99·2	
,, 8th ...	99·3								102·1				101·1					99·2		
,, 9th ...									102·1				99·8						97·4	
,, 10th ...						101			100·4				99·2						98·1	
,, 11th ...									100·4				99·2						97·4	

Private J. L——, aged 22.

MONTH.		JULY.								
DATE.		7	8	9	10	11	12	13	14	15
Day of disease.		4	5	6	7	8	9	10	11	12
Temp ..	M.	...	102·2	102·1	103	101·2	1·2	102·2	102	101·2
	E.	103·2	103·3	103·3	103·3	104·2	103·3	103·2	101·2	103·4
Pulse ...	M.	...	...	102	108	...	102	96	96	98
	E.	116	...	108	108	...	...	108	108	114

MONTH.		JULY.—*(Continued.)*								
DATE.		16	17	18	19	20	21	22	23	24	25
Day of disease.		13	14	15	16	17	18	19	20	21	22
Temp.	M.	102	102·2	102·1	102·1	102	102·4	103·1	101·1	102	103
	E.	103·3	103·3	103·1	103·1	103	103·3	104·4	103·3	103·4	102·4
Pulse	M.	108	108	114	114	108	94	108	...	...	...
	E.	...	...	...	...	...	...	...	...	...	...

MONTH.		JULY.—*(Continued.)*						AUGUST.		
DATE.		26	27	28	29	30	31	1	2	3
Day of disease		23	24	25	26	27	28	29	30	31
Temp..	M.	101·3	102·3	100	102	101	101	100	101·2	99·4
	E.	102·2	102·2	102·4	103·7	103·2	103	102·4	103·2	103·2
Pulse ...	M.	...	...	...	...	...	...	...	...	...
	E.	...	...	...	...	...	...	...	...	...

MONTH.		AUGUST.—*(Continued.)*								
DATE.		4	5	6	7	8	9	10	11	12
Day of disease		32	33	34	35	36	37	38	39	40
Temp ...	M.	100	101·1	101	100·1	99·2	99·2	97·4	98·1	97·4
	E.	102·3	102·2	101·2	102·1	102·1	102·1	100·4	100	...
Pulse ...	M.	...	...	...	...	...	...	...	...	...
	E.	...	...	...	...	...	...	...	...	...

CASE XVII.—Drummer J. S.——, admitted July 29th, having been complaining for three days previously. At present he has a hot skin, quick pulse, tongue covered with a thick white fur. bowels loose, stools fluid, of a dirty yellow colour, no pain in the right iliac region, but the abdomen is generally tender.

1*st August.*—Since last report, there has been no diarrhœa, until last night, when his bowels were moved several times. The temperature of the body, as seen in the table, has continued very high.

On the 2nd, he appeared to improve a little, although the fever still continued; urine 1026; acid re-action, no albumen. No pain complained of in the iliac region; he was at the stool four times during the night, but only passed a small quantity of fæcal matter, of a brown colour.

On the 3rd, he was worse; restless delirium during the whole night; bowels still a little loose; character of stools similar to last report; no appearance of "rose spots" over any part of the body; great pain in the head complained of; face and eyes suffused, respiration laboured; tongue has changed to a brown colour.

On the 4th, the breathing was still more obstructed—58 respirations per minute; restlessness and delirium increased; bowels were moved four times during the night; stools semi-consistent, yellowish in colour, no appearance of blood; no pain nor gurgling whatever in the iliac region.

5th.—There was no change for the better; temperature still very high; respiration extremely obstructed; breathing somewhat stertorous.

6th.—Evidently sinking; has been very restless and delirious during the night, respirations very rapid; no pain nor gurgling in the abdomen, but some tympanites set in. No improvement took place, and he died comatose at 11 p.m. Throughout the course of this case, although there was some diarrhœa, yet the character of the stools varied, and at no time were they sufficiently characteristic to lead one to expect that such extensive typhoid lesions existed, as were discovered after death. There was no marked pain or gurgling in the iliac region; no rose spots; the tongue, until the three days before death, was covered

with a white fur, but moist. There was a strong tendency to cerebral congestion from the outlet; though the urine was examined frequently, albumen only appeared on the last day. There was great diaphoresis from the first. It will be seen that this case might readily be mistaken for intensely severe remittent fever, and until a day or two before death, was considered as such, and had he recovered, would probably have been returned so.

Post-mortem appearances—9 hours after death.

Head.—A large quantity of blood in the calvarium; great congestion of the vessels of the dura mater.

Longitudinal sinus distended with blood; vessels at the base of the brain very much congested; vessels of the pia mater and lateral ventricles congested; a quantity of fluid in the ventricles; white substance of the brain dotted all over with minute vascular points. Weight 3 lbs. 3 ozs.

Lungs.—Congested at the base and posterior portion of both; this is more extensive on the right side. The lung structure, however, is crepitant throughout, and floats in water. Weight of right 1 lb. 4 ozs.; left 16 ozs.

Heart.—Empty. Weight 11 ozs. There is a good deal of fat on the outside, but the valves, &c., are perfectly healthy.

Liver.—Small in size. Weight 3 lbs. 3 ozs. Left lobe very much prolonged and thin; colour pale, structure healthy.

Spleen.—Enlarged, extremely friable, substance being almost fluid on opening the capsule. Weight 14 ozs.

Intestines.—A considerable amount of fat about the mesentery; great enlargement of all the mesenteric glands, some being nearly the size of a pigeon's egg: they are filled with a soft, friable substance, which breaks up completely under the fingers.

Stomach.—Cardiac end congested, healthy; *intestines* are filled with a quantity of yellow-coloured fluid fæcal matter. The minute vessels of the duodenum, jejunum and ileum very much engorged, and presenting a marked arborescent appearance. The whole of the mucous coat of the ileum is covered with a yellow jelly-like mucus. Up to within 3 feet of the cæcum, Peyer's patches are healthy; after this they become

gradually raised, until they are $\frac{1}{10}$th of an inch above the surface of the surrounding membrane.

In the first patch so affected, a small ulcer exists close to the margin. The solitary glands are also ulcerated. Approaching the cæcum, the condition of the agminated glands become worse, until the whole patch is involved in one mass of ulceration, and for the last 4 inches, the ulceration of patches and solitary glands is quite confluent. For the large intestine, there is no ulceration, but the whole surface of the mucous membrane is very much congested. Solitary glands in the large gut are neither ulcerated, enlarged, nor even visible to the naked eye. No entozoa.

MONTH.	JULY.												AUGUST.											
Date.	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Day of disease.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Temperature. M.	103·1	103·2	103·3	103·3	104·2	103	103·3	104·3	104·2	104·2	104·1	104·1	104·2	104·2	104·4	104·2	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1
E.	103·4	103·1	103	104·4	105	104·2	104·3	104·2	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1	104·1
Pulse. M.	109		108		120	114	112	108																
F.	112		120			120					97	98	96	96	96	96	96	96	96	96	96	96	96	96
M.																								
Respirations. E.						48	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64

Daily temperatures—in the Case of Drummer J. S—. (Case No. XVII.)

Hours.	Hours—A.M.												Hours—P.M.											
	7	8	10	11	12	1	2	4	5	6	7	8	9	10	11	13	2	3	4	5	6			
July 30					105·1			105·4				103·3							105					
" 31	7·30 105·2		10·30 105·4			1·30 106		105·2	105·1					10·30 105·4			105·5			8·30 104·3				
August 1		104·3	106·1		105·2		105·2	105·1		103			104·1			104·4			104·1				
" 2	7·30 103·3		103·3		103·1	1·30 103·3		104·3		6·30 105			105·2				104·2							
" 3	104·2		104·4		105·1		104·3	104·4				105·1	104			105·2		102·4						
" 4	103	102·4			103·2		2·30 102·4		104·3	104·2			104·4						104·2					
" 5	7·30 103·3				103·4		104		104·1				104·2			104·4					104·1			
" 6	7·30 104·4				104·3		105·1					106												

We have thus given seventeen cases, five of which proved fatal; in four of these, the most marked lesions of typhoid fever were present. In the other, or the case of Private G. P——, Peyer's patches were not affected, although there were a number of ulcers in the lower portion of the ileum, and enlargement of the solitary glands of the large intestine. This was a case the precise type of which was difficult of determination, although towards the latter stage, all the symptoms bore a strong resemblance to the others, except in the mode of death. We merely give it as a fever probably of a "*hybrid*" character. It is to be regretted that thermometric observations were only taken for last six days, owing to the want of an instrument.

In the case of Private G——, thermometric observations were taken morning and evening from the ninth day of fever to the end of the third week, when he died. Comparing these with Wunderlich's typical chart of uncomplicated European typhoid temperatures, a difference will be observed, yet the autopsy shewed the most characteristic lesions of enteric fever. A study of the several observations recorded shew some divergence from the typical one. Whether this is the peculiarity of enteric fever in India, we are not in a position to say, neither can we affirm that some of the above cases have not stamped upon them marks of malarial periodicity. But from most careful observations of the correlation of the pulse, temperature and respirations taken in conjunction with the general symptoms, we have no hesitation in saying that, whatever complication existed—malarial or otherwise—enteric fever was the chief disease, and the *post-mortem* examinations fully verified this opinion.

Since this paper was commenced, an important article bearing on the subject has appeared in a recent number of the *Lancet*, in which the following is stated:—"The occurrence of typhoid fever in India did not attract the attention of the profession prior to 1853. There can, however, be no doubt that examples of this fever occurred as far back as 1843, and it is more than probable that many cases returned as *remittent fever* and *infantile remittent*, were in reality enteric fever." These observations were made with reference to the report of the Sanitary Commissioner of Madras on the presence of enteric fever in the station of Bangalore. The Commissioner believes that, whether Dr. Budd's or Dr. Murchison's theory be accepted,

the conditions favorable to the incidence of the disease were present there.

That such conditions are also present in a very great degree in most Indian cities, cantonments or villages is apparent, and if any faith can be placed in the second annual report of the State Board of Health of Massachusetts, this disease should be of common enough occurrence in Hindoostan. Without committing ourselves to any theory on the origin or propagation of the typhoid poison, it may be interesting to mention *their* conclusions, namely, that it is considered to be a disease of scattered communities, rather than crowded towns—of rural rather than urban districts—and they summarize as follows:—"The simple continuous thread of probability which we have been able to follow in this enquiry, leads uniformly to the decomposition of organized (and chiefly vegetable) substances as the cause of typhoid fever as it occurs in Massachusetts." We have prepared tables of the temperature of cases XI to XVII taken morning and evening, between the hours of 7 and 9 a. m. and 5 and 6 p. m. In the cases XVI and XVIII observations at various hours during the day and night were registered. Our readers will find no difficulty in reducing these to the usual diagrammatic form.* From these and several other hourly notings it appears to us that, although, as a rule, the evening is higher than the morning temperature, still the greatest elevation did not necessarily occur at that time. Frequently the highest body heat was reached at noon or somewhat later. Almost constantly the lowest temperature was about 5 a.m. The thermometers were Hawksley's and Aitken's patterns, and were only divided into fifths of a degree. The average daily atmospheric temperature in the hospital during the months of May, June, July and August, while these observations were being made, was as follows for each month:—

	Max.	Med.	Min.
May ..	93	85·5	78
June ..	86	80	76
July ..	82	77·5	73
August 12th ..	85	81	77

* Diagrams of temperature accompanied this paper, but it was found that they would absorb too much space.—Eds., *I. M. G.*

International Medical Congress

ON THE

PREVALENCE OF ENTERIC FEVER

AMONG

YOUNG SOLDIERS IN INDIA

ITS CAUSES, AND THE MOST RATIONAL MEANS OF PREVENTION

BY

SURGEON-GENERAL PROFESSOR MACLEAN, C.B.

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THE PREVALENCE OF ENTERIC FEVER

AMONG

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Mr. Chairman and Gentlemen,—The subject to which for a brief space of time I am about to invite the attention of this section of the Congress is one that of late years has much occupied the attention of military medical officers in India. It is the prevalence of enteric fever among young soldiers during the early years of their service; the nature of this fever; its causes; and the most rational means of prevention. It is not in India only that this subject has awakened attention, as I shall presently show; the French army serving in Algeria has in like manner suffered, and very notably also during the occupation of Rome.

It was Dr. Bryden who first seriously awakened the attention of the profession in India to the wide-spread distribution of enteric fever in that country, and brought out the fact that youth and recent arrival there are intimately related as predisposing causes of this disease.

M. Léon Colin, one of the most distinguished physicians in the army of France, and professor in the great military hospital of the Val-de-grâce, has referred me to a valuable *brochure*, originally published by him in the March and April numbers for the year 1878, of the *Archives Générales de Médicine*. It appears that enteric fever was fatal to the French army in Algeria to the extent of 4·63 per 1,000 in the year 1868, and that the death rate in that country from the same disease was in 1872, 2·2; in 1873, 2·23; 1874, 3·2 per 1,000 effectives. As in India, so in Algeria, the young and the newly arrived were the victims. When the Pontifical States were occupied by the French army the mortality attained in the year 1868, from the same fever, to the enormous figure of 20·3 per 1000 effectives. It is a notable fact, to be afterwards referred to, that along with this great mortality from enteric fever, the same regiments serving in Rome and Algeria simultaneously lost severely from pernicious malarial fevers, and from that fatal malarial form of pneumonia from which the French army, during its stay in Italy, suffered so severely. For example, in 1868 the 35th regiment of the line lost in Rome 70 men, a mortality of 41·15 per 1,000 present; of these 48 died from enteric fever, 8 from intermittent, and 10 from pneumonia; while another regiment serving at the same time in Algeria lost in one year 13 men from enteric, and 15 from malarial, fever. I may be permitted to say with reference to pneumonia, as seen in malaria poisoned men, that the fatal rapidity with which consolidation of the lungs takes place in this disease in malaria-struck subjects is a fact with which at Netley we are quite familiar.

Up to the year 1861 enteric fever never appeared in the medical statistics of the army of India, European or native. Fevers were registered under three heads—intermittent, remittent, and continued. The two first were regarded as without question due to malaria; under the heading *Febris communis continua*, were classed all fevers not distinctly paroxysmal. Few now doubt that hundreds of cases, formerly regarded as the adynamic form of remittent, would now be classed as enteric, and still fewer that an enormous proportion of those entered in the returns as common continued fever, more particularly those with a history of bowel complication, as the diarrhœa of such cases was often phrased, were nothing else than enteric fever, as we now understand that term.

We must bear in mind that it was only about the year 1861, or thereabouts, that clinical thermometry in India was brought to aid in the diagnosis of fevers. In the General Hospital at Madras, so far back as the year 1838, the year of my first connection with India, in the old infantry barracks of Secunderabad, in the Deccan, of dysenteric notoriety, and on service in China, as far north as Nankin, I saw and treated cases of continued fever, extending over twenty days in duration, with the bowel complication above referred to, that, without hesitation, if I saw them now, I would diagnose as enteric fever. The symptoms were the same, the mortality exceeded that of fevers distinctly malarial, they were not amenable to quinine freely given, and death from hæmorrhage from the bowels was frequent, and the intestinal lesions were what we now recognize as characteristic of enteric fever. It was on my return to India after two years' residence in Europe that I first satisfied myself that such cases, in all their essential particulars, were none other than enteric fever, as that term is understood among you here. I then saw, treated, and dissected cases as distinctly enteric in their symptoms, progress, and in their post-mortem lesions, as any to be seen in the London Fever Hospital. It is useless to add that all the attempts since made to persuade the public and the profession that enteric fever is not a disease of India have had no weight with me. I now beg to hand round drawings from the facile pencil of my friend, Surgeon-Major Gillespie, made in the dead-house of an Indian hospital, from the intestines of men dead of fever of a distinctly non-malarious type, and I request you to examine the preparation in this jar, taken from the body of a young soldier who died in India, of a disease not in any essential particular to be distinguished from the fever with which in your hospitals and various fields of practice you are so familiar.

The question has arisen, Is enteric fever a new or an old disease in India? I regard this as an unprofitable discussion, and believe we might as well ask, Does the existence of enteric fever in Great Britain date only from the researches of Dr. A. P. Stewart and Sir William Jenner? No attentive student of Indian medical literature can doubt that Clark, Annesley, Twining, and many others, saw, treated, and dissected cases of enteric fever. There are more Europeans now in India of the enteric-fever-liability age than in the days of the men I have named; we study disease from better stand-points, with more light, and better means of research, and, as a natural result, our diagnosis is better. This, I believe, in few words, is the whole matter.

And now as to the all-important question of causation. It has been said—I maintain on very insufficient data—that enteric fever is not a disease from which the natives of India suffer. We know that "fevers" kill more of the native races than all other diseases put together. I have just seen the annual report of the health of Calcutta for the year 1880. I observe that 441 deaths among the native population are put down to enteric fever; the health officer doubts whether all were in reality due to that disease, but I notice a significant entry—viz., 2,072 fatal cases of continued fever, many of them with diarrhœa. How many of these were cases of enteric

fever? The deaths of thousands of natives all over India are put down as due to fevers, but the exact nature of the fever is known only in the comparatively small number of cases diagnosed by competent observers. I am not here to dogmatize, and to assert that enteric fever in India has no other factors than those with which sanitarians have made us familiar at home; but this I do say, that those who assert that the fever, so fatal to our young soldiers in India, cannot in any case be traced to pythogenic origin, have a difficult thesis to maintain. Few in this country doubt that this fever, in the language of my colleague, Professor Aitken, is generated by a specific morbid cause, fostered by, if not actually born of, decomposing nitrogenous matter. I ask, is there any country in the world in which decomposing nitrogenous matter is more abundant than in India? If so, what is there in the nature of the climate, in the various soils, to hinder the birth of the *contagium* of this disease, that elsewhere owns decomposing nitrogenous matter for its parent? It is said, and truly said, that the present sanitary condition of our barracks in India and their surroundings is such as to forbid the origin of such a *contagium* in or about them. On this point I observe that this admitted improvement is, comparatively speaking, a thing of yesterday. I have seen, and very notably in the barracks of Fort St. George, in Madras, and the old infantry barracks of Secunderabad, of dysenteric notoriety, the latrines so placed, and the conservancy of them so bad, that a privy atmosphere pervaded the dormitories of those placed near them. When a very young man, in temporary charge of the Queen's Garrison Hospital, of Fort St. George, in Madras, I placed it on record, that the majority of cases brought into that hospital of dysentery, diarrhœa, fever, cholera, came from the barrack rooms under this influence; and Surgeon-General Cornish has noted that when the dry earth system of conservancy was substituted for the old latrines, and when the sea wall of the fortress was thrown down admitting the free perflation of air, an immediate diminution in the number of fevers took place. The same authority notes that when typhoid fever prevailed in the artillery barracks at St. Thomas' Mount, near Madras, "local nuisances were abundant, in the shape of foul drains and cesspools in the neighbourhood of barracks and hospitals. As for the old privies of the Secunderabad barracks—I quote from the official report of Superintending Surgeon Cole—"they were positively pestiferous, the buildings and their neighbourhood were sodden and saturated with the foul imbibitions of a long series of years, and emitted most offensive odours." When this description was written, the regiment then in barracks was suffering from a non-malarial fever of continued type, and extremely fatal, and Mr. Cole was clearly of opinion that the disease was propagated by a direct contagium from the morbid alvine discharges. I pray my audience to note this significant fact. The 17th Lancers occupied these barracks after those dreadful latrines had been abolished, and the dry earth system substituted, when the walls were purified, and overcrowding abolished, and the result was that, in three years that fine regiment, with a strength of 576, lost only 37 men from all causes. The Royal Scots in the pre-sanitary era, having, in the same barracks, lost 104 men in one year from dysentery alone, out of a strength of 1,098 men. But, admitting, as I do, the immense improvements in the sanitary conditions of the barracks in India of the present day, I ask do our soldiers confine themselves to barracks? Notoriously they do not. The native bazaars and villages, within easy walking distance of most of our cantonments, stand on soil for ages sodden with excremental matter, and the tanks and wells of such places are befouled with like impurities. This being so, we naturally turn to the media by which such impurities may be conveyed into the system. Are there not the same there as here? Organic laden air, water, milk, or other beverages, articles of food, and, as Dr. Kerr Innes has suggested,

even clothes washed in tainted water. We know, on authority, that few English sanitarians, at all events, will contest, that, in one or other of the ways mentioned, cholera has, in examples without number, been propagated both here and in India, and why not the contagium of enteric fever. It cannot be carried into our barracks by sewer air for we have no sewers there; but will it be gravely argued that in the places of which I have spoken there is no such thing as organic laden air? I know the pains taken in India to procure for our soldiers pure, or at least relatively pure water; but, once more, is it only in barracks that our soldiers drink? The fact is, and must be, they drink when thirsty, and they drink what comes first to hand, partaking of beverages made with water taken from the sources already mentioned. But is the water supplied to barracks always so unexceptionable as has often been said? In the barracks at Rawal Pindi some years ago, an outbreak of enteric fever occurred, and several men died; one of the drawings handed round was taken from the intestine of one of the victims. Now, one of the wells of supply was found to contain more than twelve grains of organic matter per gallon, and was thick and offensive. Dr. Gillespie declines to say positively that this was the cause of the outbreak, but he notes the significant fact that, after that well was closed, no more cases of enteric fever presented themselves. I repeat, I do not wish to dogmatize. But this I do say, that our soldiers are exposed to the same causes we know to be powerful in the genesis and propagation of the *contagium* of enteric fever in this and other countries in Europe, and that I know no reason why what operates here should have no effect in India.

I have already quoted some statistics from M. Léon Colin's brochure, entitled 'De la Fièvre Typhoïde Palustre." This military physician does not admit the opinion put forth by M. Boudin, that there is a complete antagonism between malarial and enteric fever. On the contrary, he holds that there is a certain affinity between the two affections. According to M. Léon Colin, typhoid fever is a disease that may spontaneously arise under all the conditions where the organism falls under the influence of putrid miasms of different origins, whether urban or paludal. Every febrile movement, accompanied by great alterations in the secretions and intense gastro-intestinal alterations, as in those of continued or paludal remittent fever, places the organism in a condition to suffer from typhoid, by what M. Léon Colin calls auto-infection. This author has, in the work indicated, demonstrated by numerous observations the frequency of enteric fever in the most intensely malarial places; and he is of opinion that pernicious remittent fevers of malarial origin frequently pass, by what he calls a process of "transformation," into typhoid; moreover, that it is in such places that typhoid fever strikes especially fresh arrivals, just as it does fresh arrivals in crowded cities. In the French army if soldiers are suddenly landed in Algeria, they are attacked in great numbers by typhoid fever; the same happens as surely when suddenly transferred to the Agro Romano. M. Léon Colin, writing to me on the subject of this paper, is of opinion that the prevalence of typhoid fever among British soldiers freshly landed in India, has malaria (*impaludisme*) for one of its causes. According to this view the typhoid of malarial localities is a hybrid affection—in other words, the typho-malarial fever of some Indian and many American authors. I would observe on this point that the author bases this opinion very much on the fact that the morbid anatomy, in a case of typhoid fever, often presents the characteristic lesions of malarial as well as typhoid fever; the pigmented spleen and liver as well as the intestinal lesions of typhoid, but it is not always safe to draw the conclusion that both enteric and malarial poisons were operating on the organism at the same time, as the malarial lesions may be due to attacks of that peculiar fever antecedent to the attack of typhoid. At Netley we are familiar with the fact that, no matter what the disease may be which has

proved fatal in an Indian invalid, we are almost certain to see evidence of previous malarial poisoning in the organism.

I cannot in this connection pass without notice the opinions of so high an authority as the illustrious Pettenkofer, of Munich, however much they are opposed to those of the highest authorities in this country and in India. At one time Pettenkofer believed in the water theory of transmission both of cholera and enteric fever. This belief he has now finally abandoned, apparently by the simple and easy process of throwing overboard the evidence so patiently accumulated by English observers of the highest reputation—a process, it appears to me, more convenient than convincing. As the views of Pettenkofer with regard to cholera and enteric fever are identical, the statement given in a paper read before the Medical Society of Munich on the 28th of April, 1880, on cholera and its relation to the parasitic theory, thus expresses them. He insists upon the localist origin of disease, which he thus defines:—"There is a germ of a nature unknown to us at present, but which is in all likelihood a minute vegetable organism, belonging to the order of fungi. This germ may be brought into a locality by the medium of persons or things, but the persons may be healthy or sick themselves, and the transportation of the germ in no way depends upon their actual attack of disease. The germ must then find a congenial soil, nutriment, or heat, for its development. This development is probably accompanied by the production of a third substance, just as alcohol is the result of fermentation, which is the active cause of an outbreak. Thus each case of disease is the result of the individual inhaling this substance from the emanation of the soil, and the case depends upon the quantity of the disease poison so injected. But this active poison is no more capable of reproducing itself or being communicated to others, than alcohol is capable of being reproduced, or drunkenness communicated by contact with an individual."

The congenial soil may be found in the individual, but Pettenkofer thinks it more likely to be in the ground. The conditions most favourable are, a previous high ground water in a porous soil; a dry season with a falling ground water, and high temperature of ground atmosphere.

This view is strongly upheld by Dr. Soyka, one of Pettenkofer's assistants, who denies the transmission of cholera or enteric fever by means of drinking water, or by the foul emanations from rivers, drains, cesspools, or the like.

Those who accept this theory, which, as I have said, is in Pettenkofer's estimation as applicable to enteric fever as it is to cholera, must follow the example of its eminent parent and shut their eyes to the immense accumulation of facts, not theories, collected in this country and in India, pointing unequivocally to what is now regarded in both countries as a fundamental principle in sanitation—viz., that the contagium of both diseases is in the excreta, after they have gone through certain putrefactive changes, and that this *contagium* can be, and has again and again been proved capable of being not only inhaled from a tainted air, but also of being carried into the system through the medium of drinking water.

When opinions so various and so opposed to each other are held by men of eminence as to the etiology of this disease, the consideration of means of prevention is difficult indeed. One thing is certain, no hope can be entertained that the soldiers sent to India are likely, save in exceptional cases, to be past the enteric fever age. If there be any truth in the main contention of this paper, that enteric fever, however its symptoms may be masked and complicated by the influence of another and all-pervading poison, is due in the main to the same cause as here—viz., the poisoning of air, water, or food, with some of the products of decomposed nitrogenous matter—the remedy in India must be the same as here, protection from such sources of impurity. How

imperfectly this protection is afforded I need not say. One poisoned well may cause a dozen deaths in a small community before a suspicion arises as to the source of the mischief. Or an epidemic of milk typhoid may affect a fashionable quarter of London, supplied with milk from one tainted dairy—a fact requiring the aid of an exhaustive inquiry by a qualified expert to reveal. If this be so at home, let those who know India, with its faecal sodden soil, its people, their customs and habits, and the nature of the water supply they use, say how difficult, how almost impossible, is the task of protecting our young soldiers from this destructive disease. My conviction is, that success in this direction will be the measure of our success in sanitary reform, not in barracks and their immediate surroundings only, but also in the places beyond such limits, a reform only to be achieved by efforts well directed by an enlightened and vigorous administration, and hardly to be looked for in the immediate future, or until the time comes when some knowledge of the laws of health has penetrated far below the slightly educated surface of native society.

In my evidence before the Royal Commission that inquired into the health of the army of India, I pressed on the Commissioners the importance of making a greater use of hill stations for young soldiers than was then the practice; that the proper use of such stations was to preserve health, not to cure disease. It unfortunately happened that when hill cantonments were first established sanitary precautions were neglected. It was thought that elevation above the heated plains, mountain air, and so on, would be enough; and that hygienic measures, the necessity for which on the plains was not denied, at least in words, might with safety be neglected. A fatal error, as now acknowledged. I do not say that hill stations alone, however well selected and cared for, will suffice entirely to protect our young soldiers in the first years of their Indian service from the disease that is so destructive to them; but I do say, that if, on first arrival, they are quartered on hill-stations properly selected, lodged in suitable houses, constructed on hygienic principles, and clothed in accordance with the demands of the climate and healthfully occupied, we may see a marked diminution in the prevalence of a disease that more than any other to which the human race is liable, may be classed among those that are distinctly preventible.

SUPPLEMENT.

Since this paper was printed an important piece of evidence has been published which strongly supports the position contended for in my communication, and in the debate which followed its reading in the Section of Military Surgery and Medicine.

"During the third quarter of the year, there occurred in the 2/13th Regiment at Kamptee, twenty-seven cases of fever, of which eight were returned as enteric, and the rest as simple continued fever. Regarding the latter, it has to be observed that, from the description given, they appear to have also been cases of mild enteric fever, although the distinctive symptoms were not considered sufficiently marked by the Executive Medical Officer to warrant his returning them under the head of enteric fever.

The twenty-seven men attacked belonged to various blocks in the barracks, and no room seemed to be more obnoxious to the disease than another. The latrines were all in fair order and no suspicion attached to them. The drinking water supplied to the barrack rooms was taken from a well specially conserved for the supply of drinking water, and after being drawn from the well it was passed through a filtering tank and again filtered in barracks. The milk was also beyond suspicion.

After a time it was noticed that nearly the whole of those attacked were *Teetotallers*. Of the eight cases of undoubted enteric fever, seven occurred in men belonging to this class, and of the nineteen attacks returned as continued fever, thirteen were in total abstainers. Further inquiry elicited the fact, that the total abstainers had a recreation room, where tea, coffee and aerated waters were supplied, and that the water used there was taken, not from the well set apart for drinking purposes, but from another close at hand, the water of which was considered fit for cooking only. This well was situated close to the site of former latrines, the surface drain from the wash-house passed within four feet of it, and, on closer examination, signs were discovered of percolation from the drain into the well. On analysis the water was found to contain an undue proportion of organic matter. The well was then closed and the fever ceased. These facts add strong presumptive evidence that the outbreak was due to the use of impure water."

From a Report by Surgeon-General Sir. A. D. Home, V.C., K.C.B., to the Acting Secretary to the Government of Madras.

In this case it was possible to trace the disease to its source, just as we see done almost daily in this country by experts employed for the purpose. It is clear to my mind that if outbreaks of enteric fever in India could be subjected to such an investigation as the above, the result in many, perhaps in most cases would be the same.

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Mediterranean,
No. 23.

CYPRUS.

REPORT

ON THE

FEVERS OF CYPRUS,

BY

DR. F. C. HEIDENSTAM, C.M.G.,
CHIEF MEDICAL OFFICER OF CYPRUS.

COLONIAL OFFICE,
May 1886.

CYPRUS FEVERS.

Report by Dr. F. C. Heidenstam, C.M.G.

A GREAT deal has been said on the Cyprus fevers, and although their frequency and venomous character has been greatly exaggerated their existence was, and still is to a certain degree, an indubitable fact. They are mentioned by the oldest authors who have written about Cyprus, and they are now met with daily.

Amongst other authors writing of this island, Stefano Lusignan states in his "Chorograffia e breve Historia, "dell isola di Cipro principiando al tempe di Noë per fino "al 1572," page 6, although the climate of Cyprus is very fine, fevers often occur, especially in the low plains.

In Thomas Parcacchi Castiglione's work, entitled "L'isole Piu Famose del Mondo," 1663, p. 146, he states that the pernicious atmosphere emanating from the stagnant waters, and which spreads itself over the island, is one of the greatest objections to habitation in Cyprus.

P. N. Mariono Marone da Malco states in his work, entitled "Terra Santa," 1669, Chapter XXVII., p. 493, on climate, that the climate of Cyprusis beneficial in the mountainous districts, but in the plains and near the sea much water accumulates during the winter months, forming marshes which are most unhealthy during the summer season.

Giovanni Mariti in his "Viaggi per l'isola di Cipro," 1799, states, under the heading of climate, page 5: "The "opinions of a great many old authors on Cyprus are that "the atmosphere is very unhealthy, the terzana and "quartana is very common, but the effects being due "to miasma may be easily avoided;" he then proceeds to state from personal experience the means to be employed to this effect, he having suffered from it himself. On page 157 of the same work, speaking of Famagusta, he states, "that the atmosphere in question is worse than "any other part of the island, not only from the excessive

" heat, which is far more intense there than in the remain-
" ing portion of the island, but owing to the position
" of the Lake Constanza, which lies quite adjacent, and
" from which a most pernicious miasma constantly arises
" in large quantities."

L. Lacroix, in his work entitled " History of Cyprus," published in 1877, speaking on the climate of the island, says that the ancients state that the air of the island is very unhealthy, and as a proof of this statement mentions the fact that the troops of St. Ludovic, when passing through the island in 1259, all suffered severely from fever.

Capt. R. Saville, in his work " Cyprus," published 1878, states that the fevers which are prevalent in July and August are but seldom of a malignant or dangerous type, and by proper care and attention to diet they may be avoided. It is found that the fevers usually attack those who indulge in an over abundant diet of cucumbers, melons, and fruits, but comparatively seldom affect those who can afford better nourishment. Inflammations, agues, and fevers also frequently arise from imprudent exposure to either sun or wind, and from sleeping at night in the open air or near the marshes, and this risk ought to be carefully guarded against.

The term fever is supposed to signify an acceleration of the circulation, thirst, loss of appetite, elevation of the temperature, prostration of the bodily and mental powers, and a general disorder of the secretive functions. These symptoms are due to a certain cause which may be of sudden occurrence or of a slow character, mild or powerful; they may temporarily linger in action or appear at once; they may be of a most dangerous character or eventuate in a speedy recovery, according always to the power of the motor causing them, and the constitutional predisposition of the person affected.

All fevers exhibit at their commencement about the same phenomena, which at a later period take a typical character, thus facilitating their diagnoses and classification.

The difference existing between fevers consists principally in the cause from which the disease is derived. The intermittent and remittent are due to palus or paludal miasma, known as malaria, and this is the principal form which exists in Cyprus, increasing or decreasing according to the circumstances favouring or

disfavouring their origin, and the assumption that those fevers may result from other causes than from infection of malaria is simply puerile and not based on correct principles.

Paludal miasma has been generally described as a poisonous invisible effluvium emanating from marshes or marshy lands produced by the moisture of a soil rich in organic vegetable matter, and, although in the analysis of the air surrounding marshy localities no poisonous principles have been absolutely defined, the existence in the atmosphere of particles so minute as to escape not only the human vision but the highest power of the microscope has been proved.

The existence of definite organic growths in the soil and water of marshes having been detected leads to the natural conclusion that malarial miasma is a low organism which like many others exist and float in the atmosphere in an imperceptible form, pervading the human system exposed to it and varying in its effects in accordance with the constitutional predisposition of the person affected and the quantity absorbed, and in like manner to all poisons the constitution gradually becomes accustomed to its prejudicial effects.

Although the natural history of the malaria germ is still somewhat obscure, the studies of its nature having been very limited, the existence of living microbes in the systems of persons suffering from fever is an indubitable fact and can easily be ascertained by the examination through a powerful microscope of a drop of blood taken from a patient suffering from malarial fever, and not under the influence of pyretics. According to my repeated and careful observations of the blood taken from several persons suffering from malarious fever, I have detected the existence of a small spheroidal cellular body generally adherent to the hæmatin, from which it appears to derive its nourishment and sustenance as the development and growth of this parasitical element degenerates and ultimately destroys the hæmatin.

The fact once established of the existence of microbes in the systems of persons suffering from fever, it can easily be conceived that an agent which circulates in the blood by which it is carried into all the organs and tissues, destroying the hæmatin, will constitute anæmia, excite the nervous centres, obstruct the vascular departments, and cause inflammation of the viscera and spleen.

more especially of the latter, which would appear to be a spot for which those growths have a predilection, since in that organ the greatest number are always detected.

The above-mentioned are identically the morbid processes which constitute the clinical and pathological manifestations of elodes, and accordingly the interval between the period of introduction into the system of the miasma and the manifestation of those disorders, as also the variety in their effects, depends, as I have before stated, in a great measure upon the quantity absorbed, and the individual susceptibility of the person infected; thus, in one person the effects are only a slight anæmia and prostration, in another fever varying in its symptomatology and recurrence, and in a third serious disorders.

Fevers due to malaria are therefore endemic only in marshy localities and in those only when the temperature is constantly of a sufficient height to foster their existence and development, and are not met with in some typical swampy localities which do not present the temperature required. It appears to me, as far as my observations take me, that the necessary temperature for the breeding of the germ is a continuous temperature of 75° Fahrenheit and upwards. The following observation amongst others supports this theory. In Nicosia fevers began and were prevalent in the middle of July 1884, the thermometer then registering over 75° Fahrenheit, while at Larnaca only 26 miles distant, owing to fresh breezes the temperature did not rise to this height until the 15th of August, one month later, and until that date fevers did not exist. In Nicosia again, in the month of September, the temperature suddenly falling the fevers abated and recommenced in October when the thermometer for several days registered over that standard.

Not only have fevers completely ceased by the filling up of marshes in the adjacent localities, but even the addition to a marsh of a substance capable of preventing the breeding of the malaria germ is enough to stop the evil effect of the fever. This view is supported by the fact that I have often as an experiment stopped for a short period the prejudicial effects from known circumscribed fever breeding areas by the addition thereto of sulphate of iron.

The miasma, when favoured with currents of air not too powerful to scatter it, may be conveyed long distances and reach high regions. I have not however seen

it rise above a certain height; which fact I attribute more to the change of temperature than actually to a limit of its powers of ascension, supposing that the transporting medium continues to present the same advantages for its transport as at the starting point. Water, owing to its great absorbent powers, is also a factor of this miasma, and through its means malarial affections are communicated at great distances when it is used for drinking purposes, and in many cases I have observed that a defective watercourse was the sole agent for the introduction of the poison to localities where no other reason for the existence of malarial miasma could be detected.

Cyprus, generally speaking, is not a marshy country, at least, if we adopt the hygienic acceptation of the word marsh. There exist however low situated localities in the plains, which during winters of heavy rain are submerged with the water, which finds its way from the surrounding heights and becomes stagnant, or under other circumstances where the soil is dry and porous large accumulations of subsoil water are met with, and lastly in many of the principal towns and villages, owing to the overflow of defective watercourses or to the want of proper drainage, water is allowed to locate in low sites and there form stagnant ponds. The above-mentioned accumulations on a soil rich with organic matter of vegetable origin form the malaria foci to which the fevers of this island must be attributed and which would account for the prevalence of fever in what could be termed an epidemic form only after very rainy winters.

Malarious fevers have been generally divided into various classes, and some of these classifications are so complicated that it is difficult to believe that one single agent can produce so many different effects, and many who have not had the occasion of clinically observing the affection are at a loss to understand those multifarious varieties or may be under the impression that malaria is the motor of several different diseases.

After 12 years' practice in more or less malarious regions, seven of which have been spent in Cyprus where I have had the occasion to carefully study fevers, I may say that although there exists a certain variety in the symptomatology the form is of a regular and almost monotonous type, altering only in its manifestations by the symptoms becoming more or less protracted or intense.

The types which are generally met with in Cyprus are the intermittent and the so-termed remittent, which is in fact the same with the sole exception that there is no clear remission, the temperature standing for a longer period over the normal and taking a continuous form.

Those fevers are miasmatic but not contagious although some authors consider them so. This assumption seems to have been made without sufficient authority and is not borne out by recorded facts. There is no proof of their communication from body to body, and it is clearly proved that intermittent and remittent fevers are never introduced into localities by patients who may have contracted them in malarious regions, neither have I met any one who had contracted the disease by contact with patients suffering from it; we have daily examples in the hospitals and in houses where there is one person ill with the fever and another in the next bed or the whole family occupying the same room and are not affected with the disease.

All ages and both sexes are alike susceptible to the infection; many causes I have remarked may however increase the predisposition or favour the development and character of the malady. The chief or principal I have noticed are constitutional predisposition, debility, fatigue, exhaustion, insufficient clothing, moral depression, improper or insufficient food, and intemperance.

Anatomical Appearances.

Post-mortem examinations of persons who have died from the effects of simple intermittent fever are rare. I have had however occasions during my long residence in malarious regions to examine the bodies of persons who have died suddenly by accident whilst suffering from intermittent fever, and I have noted these alterations, impoverishment of the red corpuscles and albumen in the blood, dilatation of the vessels, congestion of all the upper digestive organs, notably the spleen, stomach, and duodenum, and when the fever has been of long standing I have met with signs of melanæmia and occasionally hyperhæmia in different organs, defined chronic tumours of the spleen, and amyloid degeneration of the liver, and finally in rare cases fatty granular alteration of the heart and pigmentary infiltration of the kidneys.

Course and Symptoms.

The period of incubation of malarial poison in the human system is not always the same and greatly depends on circumstances and constitutional predisposition. In the ordinary course it appears that two weeks is the usual period; in many cases however the effects seem to follow the exposure, and I have met with cases where persons have left malarious localities and have suffered from its effects for some time after in localities not malarious, which fact can only be explained by the supposition that the infection had taken place previously and remained latent in the system only acting when induced by predisposing causes.

The normal type of intermittent fever presenting clear periods of paroxysms and apyrexy may occur suddenly by a characteristic chill, but is generally preceded by prodromal symptoms, the principal of which are a general feeling of physical and intellectual constitutional disorders, presenting a more or less remittent type, a general derangement of the digestive organs, symptoms of a gastric catarrh accompanied by vomiting and dizziness, also of a remittent character. These symptoms prove the infection of malaria having existed a few days.

The first paroxysm generally commences in the early hours of the day thus contrasting with the invasion of other fevers not due to malaria miasma which make their first appearance in the later hours. A paroxysm of ague constitutes three clear stages, a stage of chilliness, a stage of heat, and a stage of sweating; these are followed by an interval of relative quietness, which is a most typical phenomenon, very difficult to account for, considering the general disturbance the system has undergone and has to undergo after a few hours if the cause is not checked, except by the hypotheses that there exists a relative initial miasmatic impregnation or that the growth constituting malarial miasma like many other microbes has a short period of life, and dies leaving its germs which at a certain period hatch to follow the same course. This latter hypothesis would explain the otherwise inexplicable phenomenon of the clockwork intermission of malarious fevers, and further it is also supported by the fact that by microscopical observations moveable organisms are only detected in the blood taken from the patient in

a paroxysm of fever, and that these cannot be traced when the patient is in a state of apyrexy.

The chill, which also presents a difference from that of other diseases, by its duration and violence, commences by a feeling of weakness, languor, and great depression, soon followed by a sensation of cold shivering, which gradually becomes intolerable, accompanied with oppression of the chest, hurried and oppressed respiration, and a beginning of headache and frequently vomiting, the epigastrium is painful and the spleen appears enlarged the pulse is feeble and accelerated. Although the temperature of the body is lower by a few degrees than the normal standard owing to diminution of the supply of warm blood to the periphery, that of the blood and internal organs rises rapidly during the cold stage to 2 or 3 degrees above it, and even more in severe cases, owing to the spasmodic contraction of the muscles of the skin and peripherical arteries. The secretion of urine is increased, it is limpid and of a low specific gravity. The appearance of the patient at this juncture is most typical, he appears anxious and looks doltish and miserable, the teeth chatter, the limbs tremble owing to the impeding of the circulation of the arterial blood, the skin is pale and shrivelled, and the pupillæ prominent. From the collection of blood in the veins and capillaries, the lips, the tips of the fingers and toes look blue. This stage lasts from a few minutes to a few hours, the duration decreasing with the prolongation of the disease. The hot stage then gradually commences, the colour returns to the skin, the pale look, the cyanic hue of lips and tips of fingers are soon replaced by a flushed face and coloured lips, the headache increases, the pulse is full and violent, the urine is rarer and saturated, the enlargement of the spleen greater, the surface of the body becomes dry and intensely hot, the mouth is parched and there is excessive thirst, the patient often is delirious or slightly stupefied. The temperature rises at the commencement of this stage reaching from 102 to 104, and in some cases 105 and 106, and remains so until this stage is passed, which lasts sometimes only a few hours, at others 8, 12, and 24, and in rare cases more.

The third, or sweating stage, is of a pleasant feeling to the patient, and commences with a slight moisture of the forehead and breast, increasing to an abundant perspiration over the whole body, the headache, heat of the

skin, and thirst abate, the intellect becomes clear, the pulse is less accelerated and soft, the urine is darkish, and deposits sediment of urite. This stage is soon followed by an apyrexy of 24, 48, or 72 hours, and even in some cases I am inclined to believe six or seven days elapse before the commencement of the second attack. This rhythm, however, may change suddenly in any of those cases to one of the others, and sometimes an attack is closely followed by a second, but in the course of this short intermission, the patient, although much relieved, and under the impression that he is quite restored to health, is weak and somewhat dull, the digestive organs are disturbed, and a feeling of inappetence prevails; there also exists the evidence of an impoverishment of the blood which increases with the multiplication of the attacks.

It is difficult to state what the normal course of intermittent fever is, as it is generally checked or modified by some treatment, but from a few neglected cases I have met with I am led to conclude that the infection of malaria continues its action for some time, even if the patient is removed from its direct source, but in such cases the effects gradually cease, even without treatment, and no recurrence is perceived. Persons affected, remaining in malarious regions even, are freed after a time from fever, often without treatment, but only when the malaria infection has disappeared for the time being. I am also of opinion that the constitution becomes greatly accustomed to the action of malarial miasma, and its effects are limited to a great extent; this is supported by the fact that persons, after a long residence in the island, are not so susceptible as strangers. The effects, however, of intermittent fever, if not temporarily or radically arrested, develop in debilitated constitutions serious organic disturbances, the principal of which are great consumption of the vital forces, owing to the repeated high temperatures reached in attacks of intermittent fever, and a greater or lesser enlargement of the spleen. Dropsy sometimes occurs, owing to prolonged and repeated hydroæmia, without the urine containing albumen or diminishing in quantity. When the disease is of a long duration, the development of permanent organic changes in the spleen, liver, or kidneys, of the form of lardaceous degeneration, sometimes results, as also parenchymatous nephritis or hemorrhægic diathesis.

These results, however, are of rare occurrence, as the disease is generally and easily arrested before serious injury to the system takes place.

The prognosis of simple intermittent fever, generally speaking, is favourable; it may, however, prove dangerous with sickly, enfeebled, or old debilitated persons by the exhaustion of the strength, and with delicate children, who, during the cold stage, are often attacked with convulsions, resulting in general paralysis, causing death. In other cases, owing to the excessive and prolonged bodily temperature, great adynamia naturally results, causing paralysis of the heart. The hyperhæmia, the inflammation of the different organs, and the obstruction of the circulation owing to pigmentary embola of the capillaries, induce complications which also suddenly endanger the life of the patient. These anomalies consist in the sudden appearance of phenomena, strange to the ordinary symptomology of normal attacks of intermittent fever, and vary in type in accordance with the organ or organs most affected, and are manifested in the course of a normal attack of intermittent fever, sometimes at the very first attack, but more commonly at the second or third paroxysm, and in rare cases after. The common form of these abnormal, or so termed pernicious attacks of intermittent fever, are as follows:—

The algid form, which is not a prolongation of the cold stage as generally believed, but commences during the course of the stage of heat, or even in that of sweating, the patient, although tormented by a sensation of extreme heat, becomes cold, the extremities, lips, &c. return to the same cyanic hue they present in the cold stage, the pulse becomes fast and small in consequence of the impeding of the heart's action, the body is soon covered with cold slimy perspiration, the cerebral faculties remaining impaired almost to the end, when the cold becomes so intense that death results, or in favourable cases after a few hours heat gradually returns, and the danger is over for that attack.

This form is of rare occurrence in Cyprus; I have met only two cases during my seven years' practice in the island, both cases occurring at the Larnaca Hospital, and both brought from the Potamia quarries, well known as a feverish area, situated on the coast between Larnaca and Famagusta. The first, a labourer at the

quarries, aged 30, was brought to the hospital in August 1881, late in the evening, having had two attacks of fever at the quarries; when I saw him just after his arrival, although the sensorium was perfectly intact, he was very uneasy, and his body, especially the extremities, was as cold as a piece of ice; within a few minutes of my arrival, and while the necessary measures and medicines were hurriedly being prepared to restore heat, he expired. The second patient, aged 35, was brought from the same quarries in about the same condition a few weeks later; urgent and appropriate treatment, however, restored the normal heat, and the patient was saved.

The choleraic form, so called from its presenting similar characteristics to those witnessed in an attack of cholera, is frequently accompanied by the before-mentioned algid form, and commences, generally speaking, during the paroxysm, by pains in the abdominal region, a feeling of faintness, closely followed by profuse incontinent watery diarrhœa and vomiting. In cases where the patient is not in the algid state at the commencement that state soon supervenes owing to the insufficiency of, and impediment in, the circulation, caused by the thickening of the blood, and from the decrease of water caused by the profuse diarrhœa and violent vomiting, thus giving the case a great resemblance to the algid state of cholera, which becomes more and more striking if the case is prolonged through the accumulation and concentration of the blood in the internal organs which are thus affected by intense congestion, throwing the patient into a typhoid state analogous to a state of typhoid cholera. In favourable cases these symptoms gradually subside, and the patient, though extremely weak and exhausted, slowly recovers; in unfavourable cases the fever acquires an asthenic character very early, the pulse becomes small and very accelerated, there is great mental depression, and the patient dies through general paralysis; in other cases there is an apparent amelioration of the symptoms, but if the disease is not checked at once a second attack follows worse than the first.

Of this form also I have observed but few cases in the island. I will here state two which are remarkable for their similitude to attacks of cholera from the circumstances surrounding them.

The first case occurred in Larnaca during the year 1882, when cholera was prevalent in Egypt, and great fear was entertained that it would be imported here, owing to the vicinity of that country to this island. I was called one night in a hurry to the hospital by Dr. Tsepis, who was then in charge of the Larnaca Hospital, to visit a sudden case of cholera. When I arrived there and met Dr. Tsepis, he stated that a patient admitted the same day had just been attacked by symptoms of cholera, and it was most probable that this patient, a stranger, had arrived from Egypt, although he denied it. I proceeded to the ward where the patient, a strong, healthy looking young man was lying, and found that he presented all the symptoms of cholera, and appeared as if breathing his last. Several medicines had been administered by Dr. Tsepis, but with little effect, as they were at once rejected, the patient being subject to frequent and violent fits of vomiting, and he informed me that he had suffered for the last two days from indisposition, which, according to his description, appeared to be intermittent fever. He had asked to be admitted into the hospital, where a few hours after his admission he was attacked with the illness showing the before-mentioned symptoms. Sulphate of quinine was administered hypodermically, and mustard poultices applied to the abdomen, the vomiting soon ceased, the patient gradually returned to normal heat, profuse perspiration set in, 40 grains quinine were ordered to be taken in four grain doses every hour, and stimulants the next morning; but when going to the hospital at that time I met the patient returning to his ordinary occupation well, but rather weak. The second case occurred during the past summer in the Nicosia Hospital. I was called by Dr. Carletti, then in charge of that establishment, owing to the absence of Dr. Stephen on leave, by a rather startling message, "Come quick to the hospital; bad news; a zaptieh "dying with very suspicious phenomena." I hurried to the spot and found a strong young zaptieh, aged about 22, who had been admitted several days previously suffering from venereal disease, presenting the same symptoms as the before-mentioned patient. He was very low, lying on his back, totally unconscious, and appeared as if his last moments were at hand. Quinine was immediately administered hypodermically, and appropriate treatment followed. I left the patient after an hour greatly relieved, and the next morning when I visited him he was up, walking about in the hospital court. At about the same hour on the second day he had an ordinary simple attack of intermittent fever which was cured by the ordinary treatment.

Another form more frequently met with in Cyprus is the soporiferous, comatose, or apoplectic, affecting the cerebro spinal. The anomaly and danger of this form consists in the predominance of symptoms physiologically imputable to the brain or the cerebrum, the patient suddenly at the end of an attack of fever has a decided annihilation of all animal and intellectual faculties, the deep stupor of the patient with the exaggerated delirium which precedes being similar to severe typhus. This form presents the following peculiarity, the coma which terminates the febrile paroxsym is very similar to natural sleep, but of a prolonged duration, and as the first attack is rarely fatal, this phenomenon is constantly considered by the friends of the patient as a salutary sleep, but in the second attack the patient sleeps never to awaken. I have met several cases of this character, one of which has remained particularly impressed on my mind as the patient was a person I highly esteemed. I called to visit him, he being indisposed, and found him rather weak, but at the time well. He told me that he had suffered the previous day from what he presumed was a bilious attack, the liver being congested. In the evening I saw him again with the doctor who was attending him. I then strongly advised quinine; shortly afterwards I left for Larnaca and I was rather startled to hear two days after that he had suddenly died. I ultimately learned that after I left he had rather an uneasy time, he became delirious but had a long sleep which was considered very favourable, the second day he had the same feeling which finished in a slumber from which he never awakened.

Post-mortem examinations of the bodies of persons who have died with this form of fever have shown melanæmia but no pigments in the brain capillaries.

The pneumonic form also is rarely met with in this island; the symptoms of this type are very similar to those met with in cases of acute pneumonia, presenting however a clear remission after every paroxysm, except in rare neglected cases when hepatization often occurs.

Sometimes also fever is complicated with bronchitis remitting with every apyrexy.

Lastly and not unfrequently we meet instead of clear attacks of fever and ague, neuralgia principally affecting the supra orbital, and in rare cases other branches of the trigemini or the cerebro spinal and vaso motor causing spasms, paralysis, and anæsthesia, but always of an intermittent type, which can only be detected as due to paludal miasma by the regular intermission and the elevation of the temperature during the paroxysms. As an example of this form, I may state a rather curious case which came under my notice in the month of July six years ago. A gentleman aged about 55, having had one or two slight attacks of fever, was suddenly taken ill with giddiness, difficulty of speech, and vomiting, soon followed by syncope, which greatly alarmed his friends who felt persuaded that he had had an attack of apoplexy, and the doctor in attendance corroborated this opinion and ordered wide venesection, which was greatly patronised at that time for that disease. The patient soon revived, and the next morning felt so well that he could proceed with his ordinary duties, when I happened to meet him; he related his case to me, stating that although he felt well he was greatly exhausted and weak. His statement as to his feelings at the time he was taken ill, as also the expression of his face, and its pale characteristic complexion, made me greatly doubt the veracity of a genuine apoplectic attack. The next day I was summoned in haste to visit him in consultation with the doctor attending him, who informed me that the patient had had a second fit of apoplexy. When I saw the patient I felt certain that malaria was at the bottom of the case; quinine was administered; he soon recovered from his faintness and had no further attack.

Those forms of abnormal or so termed pernicious fever are of rare occurrence, as I have before stated, and are only met with when an extensive epidemic of intermittent fever prevails, and are greatly attributable to the constitutional predisposition of the patient, the length of exposure, the amount of malaria absorbed, and also to the neglect of proper treatment. There has been, however, a great tendency to attribute many cases of death to severe attacks of intermittent fever, but on the other hand, I may say that many cases of this form of fever have been completely misunderstood, and this abnormal

complication has carried off patients, the cause of death being attributed to typhus fever or some dark serious chronic affection.

Continued or Remittent Fever.—This type is due to intense malarial infection, and is often met with in this island during epidemics of intermittent fever, especially towards the autumnal season; they greatly resemble in symptomatology intermittent fever, with the exception that instead of clear there are simply slight and very often almost imperceptible remissions, and a sensation of chilliness and rigour generally precedes the paroxysm. The anatomical appearances also do not differ from those met with in intermittent fever as far as the spleen and liver are concerned, but we, however, meet congestion in the brain, catarrhal and diptheritic inflammation of the intestines, and sometimes even signs of hæmorrhage into the stomach and hæmorrhagic infractions in the lungs.

The disease may be divided into three classes, mild, severe, and intense.

The first or mild class sets in with a sudden feeling of oppression about the epigastrium, mental depression, headache, and a cold feeling down the back. These symptoms are soon followed by high fever, flushing of the face, the skin being very hot and dry, the temperature rises from 103 to 105, the pulse is small and full, from 120 to 130, the tongue is furred and dry, the spleen is enlarged and mild jaundice is observed, the bowels are irregular, the fæces discoloured, and bilious matter is often vomited. A most particular symptom which I have never failed to meet in cases of remittent fever is a buzzing noise in the ears. At the commencement of this form of fever there exist irregular exacerbations, which become more and more regular, and are subsequently followed by clear remissions generally occurring in the morning; the symptoms gradually decrease, perspiration sets in, and the patient recovers. This course lasts from a few days to three weeks.

In the second, severe class, the remissions are only slightly marked at the invasion, all the symptoms of the previous form are aggravated, the patient becomes delirious and stupid, the disease lasts from eight to twenty-one days, and sometimes more, and if it ends in recovery it usually assumes an intermittent type. If death results, it is generally sudden with symptoms very analogous to typhus fever.

The third, intense class, has a striking similarity to typhus fever of a very adynamic character. There exist various disturbances of functions, and nutrition of almost all the organs, so that the symptoms vary excessively, the spleen and liver are considerably enlarged, epitaxis and hæmaturia is often noticed, and sometimes either suppression of urine or albuminuria. Inflammatory exudations not unfrequently form in the serous membranes or lungs; towards the second week petechiæ are met with on the skin, the patient soon falls into a deep apathy which is followed by collapse.

In conclusion, fevers due to malarial miasma being the principal disease, and if I may so say, the only stigma on the most fine and exceptionally healthy climate of Cyprus, and the facility and certainty with which the injurious influences which notoriously favour its development could be removed, no great marshes having to be drained, nor any great engineering skill being required, but simply a proper direction of the different watercourses, so as to prevent stagnant accumulations, it is a great pity that strenuous efforts cannot be made at once to totally eradicate this evil, owing to the want of funds which would evidently be required for the establishment of a whole system of drainage, and the laying of iron pipes in the towns, and the prevention, by proper canalisation, of the location of water on large low situated tracks of land, and the plantation of trees throughout the arid plains. But, although this desideratum has not yet been arrived at, the Government has made every effort to neutralize the most palpable evils, and the salutary effects are proved by the prevalence of fevers being greatly decreased, and their character modified in notably feverish localities where these measures have been adopted.

F. C. HEIDENSTAM.

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Duplicate Copy

Further Observations
ON THE
YELLOW FEVER
OF BOA VISTA, ETC.

BY J. O. M'WILLIAM.

J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

~~FURTHER~~ OBSERVATIONS

ON THAT PORTION OF THE

SECOND REPORT ON QUARANTINE

By the General Board of Health,

WHICH RELATES TO THE

YELLOW FEVER EPIDEMY

ON BOARD H. M. S. ECLAIR,
AND AT BOA VISTA IN THE CAPE DE VERDE ISLANDS.

BY

J. O. M'WILLIAM, M.D., F.R.S., R.N.
MEDICAL INSPECTOR H. M. CUSTOMS.

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J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

OBSERVATIONS,

&c.

I had imagined, that all doubt regarding the real nature of the epidemy that prevailed at Boa Vista, during the years 1845-6, had long since been at an end; and it can scarcely be said, that this conclusion was arrived at either hastily or unwarrantably.

My Report "On the Fever at Boa Vista," was delivered to Sir William Burnett, a few days after my arrival in England from the Cape de Verdes, in the month of September, 1846, and was laid before the Lords Commissioners of the Admiralty on the 30th October, of the same year, with a letter from the Director-General, in which he stated, that he "could not arrive at the conclusion, that the fever was occasioned by the intercourse with the Eclair."

The Report, and the letter of Sir William Burnett, having been presented to the House of Commons, in pursuance of their address of the 16th March, 1847, were ordered to be printed. And both documents being thus brought before the Profession, were very prominently and fully reviewed in the leading medical journals of the United Kingdom, of France, and of America, the greater number of which had been hitherto opposed to the contagion of yellow fever.

On the Boa Vista question, however, there was an unanimity of opinion, almost, if not wholly, unprecedented in a case of this kind; for, with one very qualified exception,

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1881

the justice of my conclusions was confirmed by the united voice of the medical Press.(a)

I need scarcely add, that Sir William Pym, the Superintendent-General of quarantine, adopted the views contained in my Report, with the exception of that in which I considered the yellow fever of the Eclair to be an exaltation of the common endemic remittent of the west coast of Africa.

Upon the presentation of the Report of Dr. King "on the Fever at Boa Vista," to the House of Commons, in return to their address of February 4, 1848, the discussion of the subject in the public journals was renewed, and my Report was again subjected to a severe sifting. Dr. King's con-

(a) "We have adopted the evidence of Dr. M'William, because we have felt bound to give credence to what is honestly and candidly stated by an observer, who must have felt the immense responsibility that rested upon him in drawing up his Report.—If we had wished to have tried a great experiment on this subject, with all available precaution, and with all the aids against fallacy that imperfect human reasoning can furnish, it would have been difficult to have devised any more complete and conclusive than that which accident, or, we should say—if it be not profane to judge of the arrangements of the universe—a providential accident, has furnished us in the case of Boa Vista."—*British and Foreign Medico-Chirurgical Review*, Vol. I., page 60.

"We have carefully examined the evidence collected by Dr. M'William, and we now unhesitatingly assert, that the above conclusions flow as legitimately from the premises, as moral reasoning will admit of."—*Dublin Quarterly Journal of Medical Science*, No. XV., p. 192.

"Upon a review of all the evidence adduced in the Report before us, there cannot be a reasonable doubt as to the contagious character of the disease that prevailed at Boa Vista: nor do we think it will be questioned, that the infection was introduced into the island by the sick landed from on board the Eclair."—*Hays's American Journal of the Medical Sciences*, No. XXVIII., p. 427.

There is not room for further extracts, but the exception must not pass without notice:—

"Although we are not convinced by Dr. M'William's reasoning as to the origin of the Boa Vista epidemic in the Eclair, we are, nevertheless, bound to acknowledge, that he has exhibited very great knowledge and practical acumen throughout the investigation, and has drawn up a Report which testifies strongly to his abilities, and redounds greatly to his credit.

"—— The symptoms and subsequent progress of the epidemic, after its outbreak in Beira Row, clearly demonstrate its identity with yellow fever, and its infectious nature.

"—— Dr. M'William appears clearly to have traced the transmission of the fever to the inhabitants of the other villages in Boa Vista, either by communication with the sick, or by the arrival of persons under the influence of the fomites of fever."—*Lancet*, New Series, Vol. II., pp. 496—498.

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clusions were wholly opposed to mine, although our main facts were the same. His views met with no sympathy (so far as I have seen) from the public press, as they were universally declared to be untenable upon the evidence which he himself had supplied. Instead of burdening this communication with extracts from the various reviews, I shall only make the following quotation from a journal that has consistently opposed the doctrine of contagion as applied to yellow fever, which will serve to convey the general opinion of the press regarding Dr. King's Report:—

"After the most careful examination of the subject, as presented by these several documents, we are constrained to confess very candidly, and, we admit, somewhat reluctantly, that Dr. King has failed in his attempt to invalidate the conclusions of Dr. M'William, logically deduced from a connected series of well-defined facts. If it be possible to prove the communication of a disease by contagion, the facts presented by this gentleman, and not disproved by Dr. King, prove, that the fever which occurred in Boa Vista was introduced by the sick from on board the Eclair, and communicated from individual to individual, until it finally extended to the mass of the population."(a)

It even appeared, that Sir William Burnett could discover no support in Dr. King's Report to his dissent from my conclusions, as it was not, on being presented to Parliament and printed, accompanied by any comments from the Director-General.

On the 10th of August, 1849, a Board of medical officers was convened by order of His Grace the Commander-in-Chief, for the purpose of investigating and giving an opinion on each of the following points:—

"1st. Is yellow or Bulam fever a distinct disease, or only an aggravated form of the marsh or remittent fever of warm climates?

"2nd. Does one attack of yellow, or Bulam fever, give, like small-pox, immunity from a second attack, except in very rare instances?

"3rd. Is yellow or Bulam fever a contagious disease?

"4th. Is yellow or Bulam fever capable of being imported?"

(a) Hays's American Journal of the Medical Sciences, No. XXXIII. p. 141.

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

The Board was constituted as follows:—

President, Dr. And. Smith, Deputy-Inspector-General of Hospitals; Dr. Thomas Spence, staff-surgeon, 1st class; John Millar, Esq., staff-surgeon, 1st class; Dr. W. H. Burrell, staff-surgeon, 1st class; Henry Pilleau, Esq., staff-surgeon, 2nd class.

The Board assembled on the 10th of August, 1849, and continued, by adjournments, to the 16th of April, 1850.

At the first sitting it was resolved,—

"First, To attentively read and examine all official or other documents available and likely to elucidate the subject to be investigated.

"Secondly, To receive oral evidence of army medical officers and other persons competent to furnish information on the points in question.

"And, lastly, After having accomplished the foregoing, then to determine the time which will be necessary to enable the Board to form their opinion, and furnish their replies to the questions proposed."

One hundred and twelve sittings, averaging three hours each, were occupied in reading documents, published opinions, and receiving oral evidence; and two months were found necessary for the purposes specified in the last resolution.

The respective opinions of the President and members were found to be as follow:—

As regards the first question,—

"The President and three members, namely, Dr. Spence Mr. Millar, and Mr. Pilleau, are of opinion, that the yellow or Bulam fever is a distinct disease, etc.

"The fifth member, Dr. Burrell, is of opinion, that the yellow or Bulam fever is an aggravated and occasional form of the ordinary fevers, continued, remittent, and sometimes intermittent, etc. etc."

As regards the second question,—

"The President and one member (Mr. Pilleau) consider, that one attack of yellow or Bulam fever does give immunity from a second attack, except in rare instances. A third member (Dr. Spence) is of opinion, that an attack of yellow or Bulam fever protects the constitution very greatly from liability to a second; but the exact extent requires further observation. A fourth member (Mr. Millar) considers, that

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one attack of yellow fever does give, like small-pox, immunity from a second attack, except in very rare instances. And the other member (Dr. Burrell) is of opinion, that an attack of yellow or Bulam fever, like length of residence, enables the constitution to resist, to a considerable extent, a recurrence of fever in the same form, but gives little or no protection against what he considers other forms of the same disease, or those which attack the acclimated."

As regards the third question,—

"The President and two members (Dr. Spence and Mr. Pilleau) are of opinion, that yellow or Bulam fever has frequently manifested a contagious power; and that on many occasions the contagious power, if in existence, could not be detected by the most careful observation. One member (Mr. Millar) is of opinion, that yellow or Bulam fever is a contagious disease. And the other member (Dr. Burrell) considers, that nothing sufficient has been adduced before this Board to determine affirmatively a question of so much importance to humanity and science; and believes the yellow fever to be absolutely and universally non-contagious."

As regards the fourth point,—

"The President and three members (Dr. Spence, Mr. Millar, and Mr. Pilleau) are of opinion, that yellow or Bulam fever is capable of being imported. The other member (Dr. Burrell) is of opinion, that yellow or Bulam fever is not capable of being imported."

(Signed by the President and Members.)

[The above contains the substance of the proceedings of the Board.]

On the 31st December, 1850, the Royal College of Physicians of London delivered a Report to the Lords of Her Majesty's Most Honourable Privy Council, respecting the Bulam, or yellow fever, which had been drawn up by the President and Fellows of the College in consequence of a communication from their Lordships.

The points investigated by the College were as follow:—

"1. As to the Bulam fever being *sui generis*, and distinct from remittent or the marsh fever of warm climates.

"2. As to its being an infectious disease; that is, communicable from person to person, and likewise capable of being imported.

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

"3. As to the non-liability of persons to a second attack of that disease.

"After a very careful consideration of all the facts and arguments adduced on both sides, with reference to the first question proposed, the College are of opinion, that sufficient grounds have not been laid for stating, that "yellow fever" is a disease *sui generis*.

"With regard to the second question, it appears to the College to be sufficiently proved, that this disease is, under certain circumstances, infectious, and, consequently, that it may be imported.

"The principal circumstances under which the infectiousness of this disease is likely to be developed, would seem to be a high temperature and moisture of the atmosphere, particularly in unhealthy seasons, and when the influence of these causes is aggravated by local insalubrity of site, and by the absence of free ventilation.

"That the disease has been in some instances imported, the history of the epidemic fever which occurred in Her Majesty's ship Eclair, and at Boa Vista in 1845, affords conclusive evidence.

"The third question proposed respecting the non-liability of persons to second attacks, does not admit of being settled in a decided manner. Strictly speaking, there is no disease of which it can be affirmed, absolutely, that one attack renders a persons insusceptible of a second.

"The College are unwilling to conclude their Report without strongly recommending to their Lordships, that, on any future appearance of this formidable malady, persons should be sent out, thoroughly qualified by education and by habits of observation, to collect evidence on the important questions which have now been proposed to the College. This was done in the case of the Eclair, and most valuable information was thus obtained.

(Signed)

"Francis Hawkins, M.D., Registrar.

"Royal College of Physicians,
December 31, 1850."

The latest investigation into the circumstances connected with the epidemy of the Eclair and Boa Vista is that which occurs in the "Second Report on Quarantine," recently presented to Parliament by the General Board of Health.

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The professed object of this investigation is to set aside the conclusions of the Royal College of Physicians and those of the Committee of Army Medical Officers, as well as the opinions of the Medical Press in this country and elsewhere; for, at page 189, "Report on Quarantine," it is stated, that, as "the case of the Eclair, and the history of the epidemic fever which occurred at Boa Vista in 1845, have been declared by high medical authority to afford 'conclusive evidence that yellow fever is sometimes imported,' it will, therefore, be necessary to give a careful examination of the circumstances relative to that epidemic;" and at pp. 115-116, "A consideration of these circumstances has satisfied most of those who have inquired into the case, that the arrival of the Eclair at Boa Vista with fever among her crew, and the almost contemporaneous occurrence of a similar disease on the island, were mere coincident events.

There is, in this language, coming as it does from a Board consisting of two lay members and one medical member, a tone of assumption, if not of disrespect, towards the Royal College of Physicians, the Committee of Army Medical Officers, and others, (who from their education, habits, and professional eminence, must be held as at least equally competent with the General Board of Health to make a "careful examination" of the occurrences in the Eclair and at Boa Vista,) unjustifiable under any circumstance, but peculiarly unbecoming of any public Board when making allusion to other Boards, more especially when the respective positions and acquirements of the parties in question are duly considered.

When I first heard that yellow fever was to form the subject of this Report, I could not (judging from the first Report on Quarantine from the same Board) but expect that the doctrine of contagion would be unsparingly, if not unreasonably assailed. I was not, however, prepared for the omission, in a public document, of facts indispensable to a just and correct exposition of the case, or for the numerous mis-statements which are to be found in that part of the "Report on Quarantine," which professes to treat of the Eclair and Boa Vista epidemy.

At the very outset of any inquiry into the epidemy at Boa Vista, there is one point that demands a clear and satisfactory adjustment, viz., the condition of health of Boa Vista, and of

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

the other islands of the Cape de Verde groupe, previously to the arrival there of the Eclair, with her crew suffering from yellow fever. It is further indispensable, to ascertain with precision the state of health of those other islands after the arrival of the Eclair, and the invasion of Boa Vista by the same disease; inasmuch as it is stated, in the "Second Report on Quarantine," page 110, that "in the adjoining island, Porto Praya (San Jago), there was yellow fever while the ship (Eclair) was at Boa Vista. Captain Simpson states, that it "recurred in the following year at Porto Praya, is common there at times, and quite endemic."

And doubtless, could it have been proved, that yellow fever had broken out on San Jago, independently of any source of importation, contemporaneously with the appearance of the same disease at Boa Vista, then there would have been grounds for supposing that it might also have originated spontaneously at Boa Vista, and that the arrival of the Eclair with yellow fever, and the outbreak of this disorder at the latter island, were mere coincident events.

By the concurrent testimony of all I interrogated on the subject,—and they included the most intelligent among the natives and Europeans at the Cape de Verde, and of all who were afterwards examined by Dr. King,—Boa Vista was quite healthy before the arrival of the Eclair.(a)

It is equally certain, that yellow fever had never before been known at Boa Vista—at all events, within the memory of any person living.

The assertion, that yellow fever was at Porto Praya (San Jago) at the period of the arrival of the Eclair at Boa Vista, or during the prevalence of the epidemy on the latter island, is so completely refuted in the documents in the possession of the authors of the "Report on Quarantine," that I cannot help expressing my astonishment that they should have repeated it in their Report.

In my Report (p. 108), I took leave, after due inquiry at the Cape de Verde, to deny the correctness of this statement, which is contained in Dr. Stewart's Report, ("Admiralty

(a) "It does not appear from the statements of the people, whether of the better or the lower classes of society, that fever was prevalent at Boa Vista at the time the Eclair arrived there, in August, 1845; and they are equally positive as to the healthiness of the other islands."—Dr. King's Report, p. 3.

Correspondence," p. 88.) (a) At p. 14 of the "Remarks on Dr. King's Report," I cited the testimony of Dr. Antonio José Nunes, Surgeon of the Artillery at San Jago, (of which island Porto Praya is the capital,) who came direct from that place to Boa Vista during the prevalence of the yellow fever epidemy there. Dr. Nunes pronounced distinctly, that the disease at Boa Vista was yellow fever, and "*quite different from those fevers which he saw every year at Porto Praya.*" (b) This, then, is the evidence of an officer who came to Boa Vista from the very spot where yellow fever is alleged to have prevailed at the time, but of which no notice is taken in the "Report on Quarantine." Again, in my "Remarks on Dr. King's Report," p. 10, there is an extract of a letter from the Governor-General to Dr. King, dated December, 1846, in which His Excellency says: "Never a fever with equal symptoms visited these islands before the arrival of the unhappy Eclair at Boa Vista."

The addition of strength to the evidence already published, refuting the existence of yellow fever at Porto Praya at the period in question, is scarcely necessary. I may, however, be allowed to quote the following passage from a letter addressed to me by the late Mr. Macaulay, Commissioner, Judge, etc. at Boa Vista, dated at San Nicolas, March 30th, 1846. Dr. Stewart says, p. 4, (c) "*In the adjoining island, Porto Praya, there was yellow fever while the Eclair was at Boa Vista.*" This statement is entirely erroneous. There neither is, nor has been, one case of yellow fever at San Jago, or any of the islands, except at Boa Vista, and then only since the departure of the Eclair."

With regard to the statement of Captain Simpson, of the Rolla, it is quite evident to me, that he has confounded the endemic remittent of Porto Praya with yellow fever. That there could have been no yellow fever there at the time

(a) The Report of my friend, Dr. Stewart, was written in London; and upon what grounds he made this statement, I am not yet aware. My refutation of it was grounded on information obtained at the Cape de Verde, and the names of my authorities are given at p. 108, "Report," and at p. 14, "Remarks."

(b) Dr. Nunes's letter is dated at "Villa da Praya," Cape de Verde, March 6, 1847. He adds: "The fevers of Porto Praya take place only in the rainy season, and they are always the same, intermittent or remittent."

(c) Manuscript Report of Dr. Stewart, given me before I proceeded to the Cape de Verde.

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1881

stated by him, has been already shown by the testimony of the Governor-General, as well as by that of the surgeon of artillery at Porto Praya.

If further proof of the immunity of Porto Praya from yellow fever, at either of the periods in question, were wanting, it is to be found in the following extract from a letter lately received from Mr. George Miller, one of the best educated, most intelligent, and keen observers whom I have ever met. He says:—"With respect to the statement, that yellow fever prevailed at San Jago while the Eclair was at Boa Vista, or while the fever raged there, I am in a position to say positively and most unequivocally, that it is untrue. I was at Porto Praya frequently during the period of the Boa Vista calamity; and it so happens, that I was also there during the whole stay of Captain Simpson, of the Rolla. From 1838 to 1850, I visited Porto Praya at least twice a-year; sometimes, indeed, three and four, and even five times a-year. I never saw, nor have I ever heard of, a case of yellow fever there; and I am as morally certain that I should have heard, had any such case existed, as I can be of anything. Indeed, there is no record of yellow fever ever having prevailed at San Jago, or at any of the other islands, except at Boa Vista, in 1845-46. I was at some pains to satisfy myself on this head in 1846, when I visited every one of the islands, except St. Vincent. I made it my business personally to seek information on this matter, from the oldest and most intelligent of the inhabitants of each of the islands. I could learn of small-pox being imported in slave-vessels, and of the prevalence, in particular years, of endemic remittent; but every one ignored the existence ever of yellow fever and black vomit. Intermittent fever is common, more or less, to all the Cape de Verds; and every year, about the second month of the rains, a few cases, in some part or other of these islands, manifest themselves."

I think it is clearly evident, that the statement in the "Report on Quarantine," regarding the alleged prevalence of yellow fever at Porto Praya, when the Eclair arrived at Boa Vista, or while the same fever devastated Boa Vista, must fall before the force of truth; and as the authors of that Report declare the *assumed fact* of the existence of yellow fever at Porto Praya, at the periods in question, to be "most material to a right understanding of this whole subject," they cannot but consider the *demonstrated fact of its non-existence* at those periods as equally important to that desirable end.

No notice whatever is taken, in the "Report on Quarantine," of the case of the lamented Dr. M'Clure, who was seized with his fatal illness (fever, with black vomit) the day (Sept. 13, 1845) on which the Eclair and Growler sailed from Boa Vista. This excellent and devoted medical officer, recently promoted after service on the west coast of Africa, was on his way home in the Growler when that vessel arrived at Boa Vista, on the 6th September, and found the sick crew of the Eclair landed at the fort in the small island. On the 8th, he relieved Mr. Maconchy, the surgeon of the Eclair, now almost worn out by his overwhelming duties among the sick at the fort. On the 13th, Dr. M'Clure was attacked with fever, having, for the first time, been on board the Eclair for a few minutes on the previous day, the sick being then re-embarked. In the previous March, the Growler had left the Coast for the Cape de Verd Islands, where the health of the ship's company was recruited, and had returned to the Gallinas and Sherbro' in April, and remained there until July, cases of fever continuing to occur from the consequences of exposure. The crew of the vessel had been quite healthy, with the exception of the gunner, and part of a boat's crew suffering from the common fever of the Coast, for between two and three months before her arrival at Boa Vista.

Sir William Burnett, who cannot be charged with any undue leaning to contagion, clearly admits, that the attack of Dr. M'Clure was due to his intercourse with the sick of the Eclair at the fort. The Director-General thus expresses himself, (when speaking of the fort,) in a letter addressed to the Secretary of the Admiralty, (Correspondence," p. 55):—"It is necessary I should add, that a fever, not originally of a contagious nature, may become so, when the sick are crowded together in a small, ill-ventilated place. *Hence the attack* of Dr. M'Clure," etc.(a)

It is now time to proceed to the consideration of the cases

(a) "Dr. M'Clure went direct from the Growler to the fort, without having gone on board the Eclair," (he was on board a few minutes.—J. O. M'W.) "and at once entered on his medical duties among the sick located there. In less than three days he was attacked with the disease,—pretty

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1881

of the two European soldiers at the fort, as they constitute the first link in the chain of evidence connecting the outbreak of yellow fever at Boa Vista with the sick of the Eclair. At page 102, "Report on Quarantine," these attacks are thus accounted for: "Two European soldiers lately arrived in the colony, and, therefore, peculiarly predisposed to an attack of endemic fever, go from Boa Vista, which at that time was healthy, to a confined, unventilated, overcrowded, and filthy spot, on another island, where fever was raging to such a degree, that, within the space of three weeks, there had occurred not less than 60 attacks, and 33 deaths, in a crew consisting, on the arrival of the ship, of 117 officers and men. We submit, that this is no evidence of the propagation of disease by a specific contagion. On the contrary, it is the ordinary production of it by its ordinary cause; namely, exposure to a polluted atmosphere, the pollution being, in this instance, excessive from overcrowding," etc.

Now, in the first place, it is not quite correct to say, that the soldiers had lately arrived in the colony, for they had been thirteen months in the Cape de Verds, and had, consequently, passed through all the changes incident to the annual rotation of the seasons. However, granting, as I have elsewhere done, their "predisposition to an attack of endemic fever," it must at the same time be recollected, that yellow fever, with which they were attacked, and of which they died, was not an endemic of Boa Vista, this disease having never, within the memory of man, been known there before the arrival of the Eclair. The epidemical constitution of the atmosphere is not invoked by Dr. King earlier than the end of September or beginning of October; nor is it assumed, in the "Report on Quarantine," to have had an earlier existence; for the seizure of the soldiers is attributed, not to an endemic, but to an accidental cause; namely, their breathing a local atmosphere "excessively polluted" by overcrowding, etc.

Now, it is fully admitted, that the place was crowded by a ship's crew labouring under yellow fever, which had cer-

clear evidence, notwithstanding his having been at Sierra Leone, that the fever had become contagious.—*Origin, Spread, and Decline of the Epidemic Fevers of Sierra Leone, etc., etc., etc.*, by *Dr. Bryson*, p. 134.

tainly not been generated, although there is reason to believe that it had become more malignant in character, there. It is admitted, that the soldiers came from a healthy atmosphere to another atmosphere rendered unhealthy, not by a general, but by a local, source of pollution; namely, the congregation of persons labouring under yellow fever, and that the result was, that they (the soldiers) became affected with the same disorder. It is denied, in the "Report on Quarantine," that the attack of these soldiers affords any "evidence of the propagation of a disease by a specific contagion; but it is allowed, that their seizure was owing to their inhaling the atmosphere, rendered morbific by the sick crew living; and it may be added, dying at the fort: in other words, by exhalation or effluvia proceeding from their bodies. If these admissions be adopted by the authors of the "Report on Quarantine," nothing further seems necessary to prove the communication of the disease to the healthy soldiers by the sick crew of the Eclair. If, on the other hand, they be denied, then it is incumbent upon the authors of the "Report," not only to prove that yellow fever was an endemic of Boa Vista, but that the endemial cause was in operation at the time the soldiers were attacked, or that the soldiers would have been seized with yellow fever, had the Eclair's crew been congregated as they were at the fort, but without any such disease prevailing amongst them. (a)

The next link in the chain, the attack of the negro soldier, is accounted for in the "Report on Quarantine,"

(a) Dr. Hosack, of New York, when speaking of cases of this kind forty years ago, very justly observes: "The visiter or attendant contracts disease from one of two sources, either from the filth of the sick room, or from a specific something issuing from the body of the sick,—the consequence of the peculiar disease under which he labours. If a person visiting another ill of the Yellow Fever or Plague derives his disease from the impure atmosphere of the apartment, I ask how it happens that in all instances he contracts the same disease with that of the person whom he visits? Why, is his disorder not an intermittent, a remittent, jail fever, or dysentery, which are considered the usual produce of filth? If he derives anything specific from the sick, his disease is then assuredly not to be considered as occasioned by the atmosphere, but depending on the peculiar condition of the fluids, or state of the system induced by the action of a specific poison; in other words, it is to be considered a contagious disease.—*American Medical and Philosophical Register*, vol. ii., pp. 13, 16.

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J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

in the same manner as are the attacks of the European soldiers.

Before advancing to the third link in the chain, (the attack of Anna Gallinha) it seems advisable to take some notice of the state of the weather before this period, and of a murrain among the cattle at Boa Vista, alleged to have existed coincidentally with the epidemy on that island.

In my Remarks on Dr. King's Report, p. 6, I stated that, from the evidence of Mr. Macaulay, the Consul, Mrs. Pettingall, and others, the weather was never more beautiful than at the period of the Eclair's arrival at Boa Vista. On the day of the sailing of the Eclair and Growler (September 13th) the weather is described in the diary of the Consul, "as warm in the sun, but with cool breezes. The weather has been of this description from the arrival of the Eclair, and to the date of her sailing we had no rain." By the same diary, no rain fell until the 5th of October. Captain Buckle (of the Growler,) also says, the "winds were N. E. to N. by E. sky always b. c. A little rain fell once or twice during the night while we were there." But, as has been already observed, as neither in Dr. King's Report, nor in the "Report on Quarantine," is an "epidemical condition of the atmosphere," assumed to have existed at this period, this part of the subject does not require further discussion. (a)

By the time Anna Gallinha was attacked (October 12th,) "much rain had fallen, the weather had become more hot, and in short there now, (but not before this,) existed the recognised elements for malarious evolution.—(*Dr. M'William's Remarks, &c.* p. 9.)

It has been seen, that in the "Report on Quarantine,"

(a) Concerning the rain and the state of the weather, extracts are taken at pp. 110 16 of the "Report on Quarantine," from the letters of the English Consul and of the "British Judge," (the late Mr. Macaulay.) I recommend those who wish to know what were the real opinions of those functionaries regarding the cause of the fever, to read their letters throughout, (pp. 35 to 40, "Correspondence on the subject of the Eclair,") as also the extract from Mr. Consul Rendall's letters at pp. 9, 10 of my Remarks.

No one capable of appreciating the amount of labour involved in making, correcting, and recording barometrical, thermometrical, hygrometrical, and other observations three times every twenty-four hours while I was at Boa Vista, will readily suppose me likely to neglect the necessary inquiries regarding meteorological phenomena at this or any other period of the epidemy.

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the attacks of the European soldiers, and that of the negro soldier at the fort, were attributed to the crowding of the crew of the Eclair. Anna Gallinha's attack, however, now that the rainy season had set in, is ascribed partly to the exhalations blowing upon the part of the town where she resided, (Beira,) from "a stagnant pool of salt and fresh water," and "from a locality resorted to by many of the people when obeying the calls of nature;" and partly to the "epidemic constitution of the atmosphere," invoked also, at this time, by Dr. King, and the authors of the "Report on Quarantine."

Now, I have elsewhere stated, ("Remarks," etc., p. 9,) that the chief expanse of stagnant water consequent upon the rains at Boa Vista, is not to be found at Beira, where the fever broke out, but immediately behind the main body of the town. As regards the other source of atmospherical pollution, the principal resort of the people for the purpose alluded to, is also behind this part of the town. In fact, in many parts of the town itself, there are receptacles of the same nature.

With respect to the epidemic constitution of the atmosphere, (a term exceedingly convenient, but more adapted to retard than to advance our knowledge of the causes of epidemic diseases,) its assumed existence during the prevalence of yellow fever at Boa Vista, is supposed, in the "Report on Quarantine," to derive support from a disease having at the same time, as it is alleged, proved fatal to numbers of the cattle on the island.

I can only say that, during the months of April, May, and June, 1846, I examined every part of the island, on one occasion, with John Jamieson and my two negro attendants, sleeping in the open air during four successive nights, making the circuit of its entire coast, traversing it in every direction, and, with my barometer, ascending and measuring the height of its principal mountains. I was in every village,—some of the villages I visited very frequently, —and I entered a great number of houses in each village. Nowhere (and no place could escape me) did I see any evidence of this supposed wholesale destruction among the lower animals. The remains of a very few cattle were, indeed, seen; but, on inquiry, I was told that every year, at the end of the dry season, and after the setting in of the

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J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

rains, some cattle were lost. At the former period, from actual exhaustion from want of food; a circumstance not to be wondered at, considering the extreme aridity of this long season, which destroys every blade of grass, and every patch of vegetation, that can find subsistence in this barren, volcanic region; at the latter period, the deaths among the cattle are attributed to their over-feeding, in this exhausted state, on the rank green vegetation which springs up even there in the plains and water-courses with that rapidity and luxuriance which is known only in the tropics.(a)

I am thus particular regarding this supposed murrain during the prevalence of yellow fever at Boa Vista, because, in a note appended to the "Report on Quarantine" (p. 317), it is with very questionable taste insinuated, that I had purposely omitted all mention of it, either in my "Report" or "Remarks."

To return to the case of Anna Gallinha. I think I have shown satisfactorily, notwithstanding the statement of Dr. King to the contrary, that this woman was a constant visiter of Miguel Barbosa and his companions while they were in the house at Beira. (*Vide* Evidence of Miguel Barbosa, pp. 22, 23; of Joana Terceira, p. 28, "Dr. M'William's Report.") But, says the "Report on Quarantine," p. 103, "supposing Dr. M'William's account to be the correct one, it is surely in the highest degree improbable that this attack of Gallinha could be owing to contagion from a man whose illness was so slight, that it did not confine him to his bed for a single day, and which was incapable of infecting his companion, who was constantly with him night and day, when there were such obvious local causes to account for her illness."

It is quite true, that the illness of Miguel Barbosa was slight while he was at Beira; but the history of all contagious disorders abundantly proves, that slight cases have the

(a) John Jamieson, the Consul's storekeeper, now in London, says, "the cattle did not commence dying until after the fever had in a great measure left the island. The disease of the cattle every year is caused by the great want of pasture before the rains, and from the overeating of the poor exhausted animals after the rains." "I saw no change in the number of locusts that visited the island in 1845-6, from any other year. More cattle than usual died at the end of the dry season in 1846, but not in 1845." "I was on the island of Boa Vista nine years."

power of reproducing the same disease in others in a severe degree, and *vice versâ*. Miguel Barbosa's companion was complaining; but, even supposing that he had not been unwell, it must be held in mind, that Anna Gallinha was a European, and, therefore, a much more susceptible subject than he, who was a negro.(a) Although, with respect to the "obvious local causes," as I have already said, "there now (but not before this) existed the recognised elements for malarious evolution;" still, I hold, that the Beira Row is less exposed to the source of such evolutions than other parts of the town, in which the other sources of pollution also exist, in much greater abundance. Even supposing the Beira Row to be as bad as the authors of the "Report on Quarantine"

(a) The following facts, arising out of the Eclair and Boa Vista epidemy, may be useful at this period as well as at other periods of the inquiry:—

On the island of Boa Vista the ratio of mortality amongst Portuguese, Spaniards, and French exposed to the fever, was...	1 in 2·28
English and Americans	1 in 1·6
Native population—Slaves	1 in 33·4
Free	1 in 14·6

Mr. Gardner, in an interesting account of a Small-pox Epidemy at Mauritius in the year 1840, read before the Epidemiological Society, states, that the disease was on this occasion introduced into the island from H.M.S. Lily, with between two and three hundred slaves on board, among whom small-pox prevailed, and for which she was performing quarantine in the roads, through the medium of a man who had been in a boat alongside watering the vessel. The case of this man, who introduced this severe epidemic into the island, and which destroyed thousands of persons, was so slight, that it was for some time doubtful whether it were really a case of small-pox. Twelve medical opinions were taken upon the case, and six considered it to be true variola; the others were of opinion that it was a case of varicella. Mr. Gardner was then referred to, and he declared the case to be one of small-pox: upon which the authorities at once placed the house in which this man lived in strict quarantine. Ten or twelve days after, a woman who had resided in the same house had the disease. Others living near soon took it, and it ultimately spread from this point over the whole island. The man at first declared he had not been near the Lily; and how he contracted the disease was for some time a mystery. He at last confessed to having been alongside the Lily, and, while there, to having taken some food from a sailor through a port-hole. Quarantine had kept small-pox out of the island upwards of thirty years. Had the channel of communication in this instance remained undiscovered, would it have been said, (one is inclined to ask, with the case of Boa Vista before us,) that, on this occasion, there was a *generatio de novo* of the small-pox virus, and that the outbreak of the epidemy at Mauritius and the arrival of the slave-laden vessel with that disorder were mere coincident events?

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1881

desire to make out, it must be considered as a circumstance not a little extraordinary, that this same state of things should have existed probably for half a century, without giving rise to yellow fever until this period, which had been preceded by some rather remarkable occurrences, viz., the arrival of the Eclair at the island with yellow fever, the death of two soldiers belonging to Boa Vista, at the fort, from the same disease; the arrival at Beira of the two sick soldiers from the place where the sick of the Eclair had been lodged, and where they (the soldiers) had already lost their two comrades from yellow fever. It is somewhat strange, to say the least of it, that this disease should further mark for its first victim in Boa Vista the woman who cooked and performed other offices for those soldiers.

"At this point," according to the "Report on Quarantine," p. 103, "the presumed chain of evidence stops; there is nothing connecting the illness of Gallinha with the next case," etc.

Let us see how far this statement is borne out by the facts of the case.

Joana Texeira, who lived in the same room with Anna Gallinha, was seized with fever three days after Gallinha's death. In five days more her son was attacked. (Dr. M'William's Report, pp. 28, 9.) Maria Nazarinha, another visiter of Gallinha's, died during Texeira's illness. Manoel Affonso, who was seen in Gallinha's house, (although denied by his widow,) and who lived near to her, was attacked the day after Gallinha died. (Dr. M'William's Report, p. 26.) Gertrude Bent, who had visited both Gallinha and Manoel Affonso during their illness, was attacked the day after Affonso's death. (Dr. M'William's Report, pp. 27, 28.)

The links of the chain could easily be extended to greater length, both from Anna Gallinha and Manoel Affonso.(a)

(a) The following clear and well arranged Tables, showing the results of the inquiry at Porto Sal Rey, are taken from the *British and Foreign Medico-Chirurgical Review*, Vol. I., p. 56 :—

TABLE, No. 1.—Names of Persons living in the Houses in the Beira Row, Pao de Varella, adjacent to that in which the Soldiers were living. There are only four houses in the Row :—

Theresa Maria Jesus, next door above.
Anna Gallinha, and Anna Terceira, next door below.
Jose Lisboa, next door to Anna Gallinha.

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It would have been much more correct had the "Report on Quarantine," instead of saying that the chain of evidence "here snapped," had stated, "here Dr. King's investigations, as regards Porto Sal Rey, are at an end."(a)

With regard to the outbreak of the epidemy at Rabil, the first case, that of Louis Pathi, is thus spoken of in the

Manuel Affonso, twenty yards away.
Gertrude Bent, next door to Manoel Affonso.

TABLE, No. 2.—Names of those taken ill first in Porto Sal Rey, with the Dates, as far as they can be ascertained. Those marked thus* fatal :—

*Anna Gallinha, October 12th.
Anna Texeira, October 19th.
*Manoel Affonso, October 17th.
*Maria Nazarinha, between October 20th and 25th.
Theresa Maria Jesus, between October 19th and 24th.
*Gertrude Bent, October 21st.
*Antonio Perica, October 20th or 21st.
Lisboa, October 21st.

TABLE, No. 3.—The names marked thus,* are those of persons attacked with fever after the intercourse referred to, within the incubative period :—

1. Persons most in contact with Miguel Barbosa and Pedro Manoel :—*Anna Gallinha, who cooked for them; *Sylvester Romess, whose wife also washed for them; *Anna Texeira, who visited them often.

2. Persons most in contact with Anna Gallinha :—*Anna Texeira, who nursed her; *Manoel Affonso, *Gertrude Bent, *Maria Nazarinha, often in the house; *Lisboa, lived in the next room; Piedad Angelica.

3. Persons most in contact with Anna Texeira :—Dr. Kenny, not taken ill for some time afterwards; *Her son, who nursed her; *Theresa Maria Jesus.

4. Persons most in contact with Manoel Affonso :—*Luis Ignes, visited him often; *Antonio Perica, who carried the corpse to Rabil; *Gertrude Bent; *the wife of Joachim das Neves.

5. Persons in contact with Sylvester Romess :—*His child, niece, and wife.

6. Persons in contact with Antonio Perica :—*His wife; *Eusebio da Luz, who nursed him; *a girl in the house.

7. Persons in contact with Lisboa :—*A son of Senhor Carvahal, who was two nights with him.

"If our readers will now glance over the names contained in these three Tables, they will find that each is almost a copy of the others, and they will find that the proof is complete, that certain persons, living nearest and most in contact with the two soldiers, were first attacked. This is a fact, and is independent of all explanation or hypothesis of contagion."—*British and Foreign Medico-Chirurgical Review*, Vol. I., p. 57.

(a) "With regard to the future spread of the disease in Porto Sal Rey, Dr. King is silent; he does not allude to any cases subsequent to that of Anna Gallinha."—*British and Foreign Medico-Chirurgical Review*, No. 3, p. 167.

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J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

"Report on Quarantine":—"It will scarcely be considered as affording an additional link, since, admitting that this man contracted his fever while employed on board the Eclair, his case would be merely one of infection from going on board a foul ship," etc. "But as in the locality of the dwelling of Gallinha, so in the district in which this man lived, there were local causes abundantly sufficient to account for the endemic origin of the disease." ("Report on Quarantine," p. 104.)

It will be remembered by those who have examined the Reports of the Boa Vista fever, that Pathi was taken ill at Moradinha, where he remained eight days, and was then conveyed to his house in Rabil, where, I am of opinion, he arrived about the 25th September, and that one of his daughters was first seized in the beginning of October; the rest of his children and his wife were attacked in succession, all much within a reasonable incubative period.(a) I need scarcely add, that the evidence as to Pathi's being the first case at Rabil is overwhelming.(b)

The "Report on Quarantine," with reference to Pathi's case, continues:—"It is also to be particularly observed, that a child in another family at Rabil, having no communication with the family of Pathi, died about the same time as Pathi's first child," &c.—(Report on Quarantine, p. 104.)

This statement is made, I presume, on the strength of a reply to a question (1327) put to José Marques; but the evidence of Joaquim Pathi (751), the cousin of Luis Pathi, (more likely to remember events in Luis Pathi's family than

(a) Dr. King states, that the children were not taken ill until a month after the father's return home. I must here observe, with reference to this or to any other difference between Dr. King and myself, as regards the epidemy, that I beg to refer to the answers given to my questions, which are set down in detail. Dr. King's Report contains no such means of reference; and I must leave it for others to decide whether the mode of inquiry pursued by Dr. King at Boa Vista, or that adopted by myself, was best calculated to elicit truth from the interrogated, or to convey the real facts of the case to others. Dr. King's method of inquiry is to be found at p. 4 of his Report.

(b) "The following are the names of the owners of the houses immediately adjacent to Luis Pathi:—Manoel Fachina, Joaquim Marques, Joaquim Pathi, Manoel Rosa Luis Delgado Nazario.

"The following are the names of those first attacked in Rabil, with the dates, as far as they can be ascertained:—

"1. Luis Pathi—Sept. 18th. [Moradinha, J. O. M'W.]

Marques,) goes to show, that Pathi's children were the first that were taken ill at Cabecada. But, even supposing that Manoel Fachina's child "died about the same time as Pathi's first child," or even was the first case of death, it must be recollected, that he lived next door to Luis Pathi, in whose house, by Fachina's own evidence, his wife (among the first, if not the first attacked in Cabecada after Pathi's arrival) had been a frequent visiter during Pathi's illness. So much for this alleged "non-communication," which is most unwarrantably assumed, being wholly unsupported by evidence of any kind.

It seems scarcely necessary here to follow out the Fever in its course to the other villages. In my Report, it will be found, that its origin at each village is traced to contagious importation. This I always ascertained by going from house to house, and personally examining the inhabitants.

I must claim for my Report, in all cases of supposed difference between Dr. King and myself, the probability, at least, of much greater accuracy as to events and dates than that of Dr. King; for my conclusions were founded on the examination of many persons on the spot, nay, in the very houses where the fever first appeared, and in those to which the fever afterwards spread, in each village.

This does not seem to have been done by Dr. King; as, for instance, he seems to have relied almost exclusively, if not entirely, upon the evidence of the Judge at Fundo das Figueiras, for his information regarding the whole three eastern villages, Cabeca dos Tharafes,—Fundo das Figueiras, —and Joao Gallego.

"2. Wife of Manoel Fachina—soon after the return of Luis Pathi to his own house, viz., the 26th or 28th September. She had been a good deal in the house of Luis Pathi.

"3. Child of Manoel Fachina—very soon after the mother. This child died about the same time as Luis Pathi's child, or, according to some evidence, before.

"4. Two children of Luis Pathi—4th and 11th October.

"5. Manoel Marques—very early in October.

"6. Joaquim Marques—between the 8th and 12th October.

"7. Joaquim Pathi—about this time.

"8. Family of Joaquim Pathi—soon after the father.

"9. Manoel Rosa—immediately after Joaquim Pathi.

"10. Child of Manoel Rosa—two days after her father's attack.

"11. Luis Nazario—two or three days afterwards."—*British and Foreign Medico-Chirurgical Review*, Vol. I., pp. 57, 58.

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1881

With regard to Cabeca dos Tharafes,—the most important, in this inquiry, of the three villages, inasmuch as it was the first in which fever appeared in that part of the island,—I have good reason to believe, that Dr. King did not once enter this village. Then, as respects Porto Sal Rey, the mode in which Dr. King obtained his evidence there was chiefly, if not wholly, thus:—His list of queries were written down, and John Jamieson, the Consul's storekeeper, alone went the round of the houses, getting answers to those queries in the best manner he could, and then brought them to Dr. King, who transcribed them, thus obtained, into his own journal, or note-book.(a)

This was not my mode of investigating the facts of the epidemy. I found John Jamieson a very useful and willing assistant in all my journeys and inquiries; but I myself was present at the examination of each person, and put the questions and received the answers myself.

I should not have taken this notice of Dr. King's method of investigation, had I not felt compelled to do so, from the evidence I procured having been alleged, in the "Quarantine Report," to be "loosely taken," &c.; while the "details" of Dr. King are stated to be "most circumstantial." I feel necessitated to defend my own Report, when unfairly assailed, and to show the real value of the "set-off" attempted to be brought against it.

In the "Report on Quarantine," it appears to be assumed, that, to prove the contagiousness of a disease, all persons exposed to the supposed source of contagion, whether directly, by intercourse with the sick, or indirectly, by communication with those who, although visiting the sick, continue in good health, ought to be infected.

A very slight acquaintance with medical etiology would have suggested, that the laws of contagion involve no such necessity. It is in accordance with those laws that the greater number of those exposed to morbific influences escape, and that some of those chiefly in contact suffer. "To insure," says Professor Simpson, "in any instance, invariability of antecedence and consequence among physical, metaphysical, and vital phenomena, the circumstances under which the causes are applied must be, at all times, in

(a) I have received this information from John Jamieson himself, a man whose word I never had reason to doubt.

all necessary points, perfectly similar." Moreover, before the body can be rendered susceptible of a contagious or any other morbific influence, it must be so far altered from the standard of perfect health as to constitute that particular, although unknown, state which is called "predisposition." It is well known, that physicians and others constantly visit patients labouring under notoriously contagious diseases, but nevertheless escape. Or they may escape nine times, yet be infected on the tenth.

From want of attention to these simple but well-established facts, and from not duly considering the particular circumstances of each case, we find that, throughout that part of the "Report on Quarantine" which treats of the Boa Vista epidemy, it seems to be a matter of wonder how, if the disease in the Eclair was contagious, it was not introduced into the town by the crew, who got leave shortly after the ship's arrival; why the women who washed the foul linen escaped until after the fever was general in Porto Sal Rey; why Captain Estcourt did not infect the family of Mr. Macaulay; why the officers of the Eclair and their servants, who lived in the house at Santa Barbara, did not communicate the disease to the people of that house, or to that of the town; why Dr. Kenny, Dr. Almeida, and John Jamieson, did not carry the infection with them to their respective homes; why the soldiers Perez and others did not at once infect the barracks; why the labourers aboard the Eclair and at the coal heap, and their families, did not earlier suffer from the disease; why the Governor-General and his suite, who fled to the other islands, not only all escaped, but failed to infect any others in those islands, etc.

Facts are wanting to establish with absolute certainty, although we are far from being in a position to deny, the transmissibility of yellow fever through the medium of fomites. All, however, will admit, that this mode of the propagation of any disorder capable of being propagated from the sick to the healthy, is far less powerful than that arising from direct intercourse with sick persons.

Now, it has never been alleged,—in fact, it is in the highest degree improbable,—that any of the petty officers, or of the few seamen who got leave, were otherwise than in good health, or were not, at all events, as well as men could be after service on the West Coast. With respect to the washer-

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1881

women, the clothes washed by them belonged to the officers. Now, no officer, with the exception of two, (the gunner and a master's assistant, who were placed on the sick list for fever on the 1st August, and discharged to duty, the one on the 13th and the other on the 19th of the same month) had been the subject of fever from its outbreak up to the period of the arrival of the Eclair at Boa Vista. In the Admiralty Correspondence (page 28) it is, moreover, stated, (and, by the way, is not noticed in the "Report on Quarantine,") that the bedding and clothes of all deceased persons were thrown overboard. The washerwomen, therefore, could have washed the clothes belonging to two persons only who had suffered from fever, but none belonging to those who had died.(a)

As respects Captain Estcourt, after he went to Mr. Macaulay's house, he observed the greatest precautions after his visits to the fort, carefully washing himself and changing every article of clothing before seeing any member of his family. He became a guest of Mr. Macaulay on the 25th of August, and Mr. Macaulay and his family left Porto Sal Rey for the north side of the island, on the 4th of September, and did not return until the 27th of that month; so that, during one-half of Captain Estcourt's sojourn at Porto Sal Rey, the only persons with him in Mr. Macaulay's house were the black servants.

As regards the officers and their servants, the house in which they lived was entirely given up to them, and occupied by them exclusively. They were sent to the fort in accordance with a rule of Captain Estcourt's, rigorously carried out, not only as regarded the officers and the crew, but likewise himself. Mr. Macaulay, in a letter to me, dated at San Nicolas, March 30, 1846, says, on this head:—"Dr. Stewart states, at page 5,(b) some of the officers and their servants were attacked with fever while in the town; the Captain was taken ill while living in the town in the house of an English family. The purser lived in the house of another English gentleman when taken ill, and remained there until the day before his death."

(a) I have since ascertained, that the Gunner's clothes were not taken ashore. Those who know anything of men-of-war, are aware that the clothes of the crew are washed and scrubbed on board.

(b) Manuscript Report.

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"The above passage," observes Mr. Macaulay, "conveys a very erroneous impression. The rule laid down by Captain Estcourt, *and strictly followed in every instance*, was, that, if any of the officers or servants living in the town were taken ill, they should be *immediately* conveyed to the hospital on the small island. I was present on the occasion when one of the Eclair's lieutenants came to request of Captain Estcourt that a brother officer who felt unwell might be allowed to remain, at least for a short time, at the officers' quarters in the town, until it could be ascertained whether he had fever or not, as it was hoped that a dose of medicine would set him to rights. Captain Estcourt refused to comply with the request, stating, that he should require all his officers to follow the same course which he should observe himself, and to remove to the hospital at the fort, as soon as any symptoms of illness was felt. This was the conduct actually pursued by Captain Estcourt when he as attacked a short time afterwards."

The intercourse between John Jamieson and the Consul's family was restricted as much as possible, and Dr. Kenny lived in a house by himself. The family of Dr. Almeida was at this time chiefly at Boa Esperanza, about two miles from Porto Sal Rey; and he visited the fort once only while the sick were there, or twice at the very outside.

It never has been alleged, that Georgio or the two prostitutes Anna Gaspar and Rozina St. Antao, were infected by the crew of the Eclair. The headache and other symptoms, mentioned by Georgio, constituting as they did part of his evidence, were noticed in my Reports, as statements arising out of the inquiry, but not as matters of importance.

Athanasio Perez was relieved from his guard at once when he was taken ill at the barracks. Pedro Manoel, of the same guard was not sick, until the fever was general in the town, in which there is nothing very extraordinary; and Antonio dos Santos, also of this guard, was not taken ill until three weeks after his return from the fort. The non-infection of the soldiers at the barracks by the disease proves nothing further, than that, from those cases, or from the case of Manoel Antonio Alves, who was four or five days ill in the room behind the barracks, the disease was not communicated,—a circumstance by no means uncommon in the history of contagious disorders, and con-

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

stituting a mere negative fact of little moment in an epidemy, which furnishes abundant instances of positive contagious propagation. (a).

It is judged, in the "Report on Quarantine," that the fever, if contagious, ought to have been communicated to the labourers employed on board the Eclair, in the launches, and at the coal-heap, and by them to have been conveyed to their families at a much earlier period.

The answer to this is obvious. No labourer, with the exception of Portajo, the slave who died, ever was within the walls of the fort while the sick were there, although the coal-heap labourers mixed with the healthy portion of the crew; but many of them (Luis Pathi among the rest) were on board the Eclair the day on which the sick were re-embarked.

As most, if not all, of the labourers were at one time or another on board the Eclair, I might, with much greater reason, ask, How did they escape from the effects of the dreadful malaria alleged to have existed in the hold? The labourers, at all events a large portion of them, were continually being exposed to this supposed source of

(a) An attempt is made, in a note (pp. 306 to 317) appended to the "Report on Quarantine," to damage the value of the evidence, because Miguel Barbosa stated that Luis Briza was sick in barracks when he was, and as Briza died on the 12th November, he was ill about thirty-six days. No notice, however, is taken of the evidence of Corporal da Cruz Silva, in which he says, that "he thinks Luis Briza was not taken ill until the fever was general in the town." Corporal Silva belonged to the same guard with Briza. And as Briza did not die until November 12th, the probability is that the corporal was right, rather than Barbosa, who was himself ill at the period of which he spoke. Then there are also objections, because the soldiers of the guard did not earlier infect the barracks; because there is no proof that Luis Pathi assisted to hoist the sick in, although he was on board when the sick came from the fort; because one man—the slave of Senhor Nicolas Tavares—disputes the claim of Chico Fernandes having been the first case at Estacia, in opposition to the evidence of Senhor Tavares himself—a most intelligent man, and to that of Chico's sister, Libania; because it is doubtful whether Dr. Almeida visited the fort once or twice. These and other comparatively insignificant circumstances are dilated upon at length, and apparently with great self-satisfaction on the part of the writer. But the note throughout is indicative of a desire, it may be of a capacity, limited to carp at the occasional discrepancies to be found in the evidence—to deal, in short, only with the minor and unimportant details, and not with those main and leading facts of the case which serve to guide the judgment in the elimination of the truth from any amount of evidence submitted to it.

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[2788.—250.—5/86.]

miasmatic poison; but they were not within the sphere of contagion from the sick until the last.

The soldiers of the guard, on the other hand, were all the while more or less in direct intercourse with the sick at the fort, and accordingly we find among them the first attacks and the first deaths at Boa Vista.

Nor, as has been said before, is it at all necessary, as is assumed in the "Report on Quarantine," that "to prove the spread of a pestilence by contagion, communication, either direct or indirect, must be proved to have existed between all the persons attacked." ("Report on Quarantine," p. 104.)

If the first cases of yellow fever, or of any other disorder, appearing in any town or locality, are distinctly traced to a contagious source, we have no right to deny, although we may not be able to prove communication in *every* case, that the spread of such disorder is due to the same cause. If the disease be admitted to be contagious in the first cases, *à fortiori*, it must also be presumed to be so in all the other cases, although we may not be able to connect every link of the chain of propagation. Our failure to establish such an unbroken chain in all the cases occurring from the beginning to the end of an epidemy, would not show the want of a contagious cause throughout, but rather our want of success in discovering it in every such case.

"The Report on Quarantine," p. 96, observes—"According to the view of Dr. M'William, therefore, this disease must have been of a very singular character, for in its origin at Shebar it was not contagious, at Boa Vista it became contagious, while in the other islands of the Archipelago, wherever the sick and the uninfected fled, it again laid aside its contagious character, and did not spread to a single individual."

This is not the place to discuss the question of a disease primarily not contagious, having the property of contagion impressed upon it by contingent circumstances; but it has been generally allowed, that the history of the events of the Eclair greatly favour this view. But the statement, that it laid aside its contagious qualities afterwards, demands special attention, as it rests upon no grounds whatever.

I assert, without fear of contradiction, that with one very notable exception that came to my knowledge long after my

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

"Report" and "Remarks" were written, among all those who fled from Boa Vista, it cannot be shown that any sick persons landed at any of the other islands. Those who fled from the island were people of the better class, and while at Boa Vista adopted precautions against infection. This was the case with the Governor-General, Mr. Macaulay, the Collector of Customs, and others who left the island after the fever had well broken out. The Governor-General, in his letter, distinctly states, "not one of those who emigrated to the different islands of the Archipelago *had the disease, or communicated it to others.*" Where did the authors of the "Quarantine Report" learn that any "*sick*" fled to the other islands?

"When," says Mr. George Miller, "the ship that conveyed the Governor-General and his suite to Brava, was entering the harbour of that island, one of His Excellency's servants was found to be suffering from the fever. The dismay and confusion at this discovery were great; but it was quickly resolved upon that the servant should be landed and placed in a cavern at some distance to leeward of the landing place, and there kept in strict quarantine. The sequel is this: the poor man died, all his things were burned, and the body was, with the observance of great caution, buried. The disease was not communicated to the shore; and the Governor now issued a Portaria, declaring Boa Vista infected, and subject to the most stringent quarantine regulations; and most rigorously were they enforced."

I found it impossible to arrive with any degree of certainty at the correct amount of the population of Boa Vista not attacked. As an approximation to the truth, I supposed that a third of the whole probably escaped. But we know, without doubt, that, with the exception spoken of, Don José di Norronha and his suite, consisting of sixty persons,(a) Mr. Macaulay and his family, Mr. Pettingall and his family, the Consul and his family, Mr. Martines and his family, who left the island, all escaped, except those that afterwards

(a) In my "Report" there is a mistake (whether owing to an error in the manuscript Report, or to a typographical error I cannot say) concerning the suite of the Governor-General. It is stated, that the "suite" consisted of sixty Europeans. This was not the case. There were sixty persons, but by far the greater number were natives of the islands, and the remainder were Europeans.

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[2788.—250.—5/86.]

returned and had intercourse with sick persons. If we add to these, Dr. Almeida's family and servants, and those who segregated themselves at Espinguera, at Cantor, and at Agua dos Caballos, we have, on the most moderate computation, 250 persons, among them upwards of fifty Europeans, who adopted precautionary measures, and all escaped.

Now, I will put it to any unprejudiced person, whether favourable or unfavourable to the doctrine of contagion, how, supposing the disease to have depended upon a cause existing in the general atmosphere, Don José, his suite, and all the other families, could by any means escape? Can it be believed, that not one, even among the Europeans, was susceptible of this alleged generally pervading influence?

Judging from all experience of the action of miasmatic poisons, the escape of so many persons is inexplicable, on the assumption of the disease having been owing to a virus floating in the general atmosphere. But their immunity can be rationally accounted for, under the precautionary circumstances stated, on the ground of the propagation of the disease having been dependent upon intercourse with the sick.

The opinion of the Governor-General, as expressed in a letter that appeared in the *Gibraltar Chronicle*, attributing to the fever at Boa Vista an endemic origin, is very prominently paraded in the "Report on Quarantine." His Excellency's letter to Dr. King, an extract from which is given in my "Remarks on Dr. King's Report," p. 10, telling him that no such disease as that which devastated Boa Vista was ever known in those islands before the arrival of the Eclair, and that "the fevers which have a local or indigenous origin, are called by the doctors *miasmaticas*," is passed by in silence in the "Report on Quarantine." In a letter to me, dated Jan. 8, 1848, (also to be found in my "Remarks," p. 10,) His Excellency says: "You here see I have changed my first opinion. I am quite convinced that the fever was contagious, and that it was introduced into Boa Vista by Her Britannic Majesty's ship Eclair." Long before His Excellency wrote to Dr. King, he stated (in a letter to Mr. George Miller), "I am convinced the fever was contagious from its commencement, and during its progress over the island."

These statements, of which the authors must have been

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

fully cognizant, are never alluded to in the "Report on Quarantine."

Nor is there in the "Report on Quarantine" the slightest notice taken of the well-established instances of exemption from fever procured during its prevalence at Boa Vista by isolation and segregation of healthy individuals from infected districts, which are detailed in my "Report," pp. 107, 108, and in my "Remarks," p. 10. "At *Espinguera*, near Mount Broyal, *at Cantor*, near Mount Ochello, and at *Agua dos Caballos*, situated little more than a mile from Cabeca dos Tharafes, I saw so late as May, 1846, little colonies, amounting in all to fifty-seven persons, who, in the early part of the epidemy, had fled from Joao Gallego, and other villages, and cut off all communication with them. Not one that remained was attacked."(a)

I would ask,—Is the omission of all notice of these statements dealing fairly with the question? There surely appears in such a mode of procedure a one-sidedness more becoming a reckless crusade against Quarantine and contagion, than a philosophical and impartial search after truth.

In a note appended to the "Report on Quarantine," pp. 237, 238, there is an extract from Dr. King's "Report," in which, after speaking of the murrain among the cattle, it is stated, that "there was this remarkable coincidence,—that after an interval of *some months*, and the disappearance of the disease both in man and beast, the same fever broke out again in the towns and villages about the rainy season."

Dr. King has not supplied us with the facts upon which he built this statement; but I am in a position to prove, that the first case after I left the island occurred on the 19th or 20th July, 1846, in a person well supplied with the necessaries of life, in one of the largest, cleanest, and best-ventilated houses in the town. Recovery took place after extreme peril. The next case was a respectable salt-merchant, who also lived in a good house, and had visited the first case. The third case was also a salt-merchant in good circumstances, and living in a good part of the town. I could multiply the cases if necessary. I shall only add, that communication

(a) Dr. King, in his Report, does not allude to the negative evidence derived from these sources, or, indeed, from any source whatever. This may be explained upon the circumstance of his never having visited any one of these places of refuge.

with sick persons was in each case proved, and that the two last-mentioned cases died during the illness of the first. The girl "Perpetua" died at Moradinha, on the 1st of June, and on the 13th of the same month the remaining patients were convalescent.(a) When these dates are compared, the actual interval between the disappearance and re-appearance of the fever will be found to shrink considerably within *months*. The interval, in short, instead of being *months*, as stated by Dr. King, was little more than *one month*, or about the same as that between the last cases at Joao Gallego (the end of April) and the outbreak at Moradinha (the 30th May of the same year). By Dr. King's own account, the rainy season of 1846 did not set in until about the middle of August.

The note adds:—"Dr. Almeida, of Boa Vista, considered the disease alluded to as an aggravated type of the bilious remittent, and in such belief he positively continued until after the arrival of *a communication* from the British superintendent of Quarantine." In a foot note, it is stated, on the authority of Dr. King, that "Dr. Almeida was a general merchant, who sold a few simple drugs, and gave his advice gratis. It might hence be inferred, that his opinions, even if they had been fixed, could have been of no great value."

Dr. King held no such despicable estimate of Dr. Almeida's opinion, when he brought it forward, rather triumphantly, and in contradistinction to the opinion of every one else on the island, in his "Report," p. 4, to the effect that the disease at Boa Vista was "an aggravated type of bilious remittent."

In my "Remarks," p. 14, I adduced Dr. Almeida's evidence, given eight months before Dr. King saw him, and a letter written by Dr. Almeida six months after Dr. King left Boa Vista, showing clearly, that Dr. King was entirely in error regarding Dr. Almeida's opinion as to the nature of the disease. After this, any disparagement of Dr. Almeida must come from Dr. King with a bad grace. It is too late to tell us, now, that Dr. Almeida's real opinions do not suit Dr. King's views,—that they are not to be relied upon.

I am also enabled to assert, that no communication was ever sent, either directly or indirectly, to Dr. Almeida by the British Superintendent of Quarantine, nor did Dr.

(a) Vide Dr. M'William's "Report," etc., pp. 94, 95.

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LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

Almeida know anything of the opinions of Sir William Pym regarding the fever up to the time I left Boa Vista.

But, as it appears that, notwithstanding the evidence and the letter to which I have just alluded, doubts seem to remain, in some quarters, regarding Dr. Almeida's views and the nature of the fever that devastated Boa Vista, I am compelled, although most reluctantly, to append the following extract of a letter from Dr. Almeida to myself on this subject:—

"From conversations that Dr. Leao and myself had with Dr. King, we discovered, that his object was to prove that the yellow fever was not imported into this island by the steamer Eclair. He always found us opposed to this; and we proved to him by positive facts, that he was in error. I told him, that during nearly forty years' residence in Boa Vista, I had never before seen a case of yellow fever, either here or in any of the other islands of the Cape de Verds Archipelago; but that I had occasionally seen intermittent fevers at Rabil when, in the rainy season, the waters remained stagnant for some time. Dr. King has, in his report, been pleased to pervert these conversations to suit his own erroneous views, not remembering, perhaps, that to foist them upon the public he has misused the name of one who, like himself, is in the Profession."

In the same spirit, and proceeding from the same source, an attempt is made in the "Report on Quarantine," p. 107, to deteriorate the value of the evidence obtained at Boa Vista, the witnesses being described as poor and ignorant, giving their "evidence in the loosest possible manner; their statements as to details and occurrences alleged to have happened several months before the inquiry took place were received implicitly, without examination into the correctness of their answers and the credibility of their testimony;—all the witnesses of this class appear to have spoken under the influence of the strongest feeling of self-interest, with a view to establish a claim to pecuniary compensation, should they make out a case against the Eclair."

As the chief of these allegations against the people originated with Dr. King, one is led to inquire how, from such sources, was it possible he could obtain his "indubitable facts"? As to the length of time intervening between the occurrences and the inquiries into them, if this be raised as

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an objection, it must apply with greater force to Dr. King's inquiries than to mine, because I preceded him on the island by eight or nine months. As regards our respective methods of conducting the inquiry, I might waive the discussion of this part of the subject, and leave it in the hands of others, observing, however, that high legal as well as medical authorities have considered the value of the evidence in the very opposite light to that which the "Report on Quarantine" might lead people to suppose.(a)

The assertion, that the statements of the witnesses were received, "without examination into the correctness of their answers," is at variance with fact. When so many persons were examined, and upwards of 1600 questions answered, it could hardly be expected that some discrepancies would no occur. I think, however, it will be generally allowed tha m every essential point, the evidence of the people tallies with that of the higher orders at Boa Vista, and also with the information that has since come to light from Consul Rendall and others.

In a case of this kind judgment ought to proceed, not from a few casual discrepancies, such as occur in the evidence, and which are so eagerly caught up in the "Report on Quarantine," but from the general tendency of the evidence. The order of events may be noted without precision as to dates; but in the main points, as regards the first attacks at the Fort, at Porto Sal Rey, Cabecada, at Boaventura, Estacia Velha, Fundo das Figueiras, and Joao Gallego, the dates are given so as to be correct within one or two days. There is less certainty about the dates of the invasion of the other villages by fever; but the first attacks are in every case defined, and the radiations of the disease are followed out more or less extensively from each of these foci.

I consider that the following observations on the *Summary*, contained in pp. 114, 115, of the "Report," to be justifiable from the whole tenour of the evidence adduced in the case of the Eclair and Boa Vista:—

1. The fever which broke out in the Eclair, when on the

(a) For Dr. King's method of inquiry, see Dr. King's Report, p. 4. The mode I adopted is to be seen in my "Report," and in the "Remarks," p. 11.

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

west coast of Africa, was the common endemic, which became altered in character as the cases increased at Sierra Leone, between Sierra Leone and Boa Vista, and at Boa Vista, is proved—

By the great proportionate increase of mortality at those periods.

By the report of survey of the medical officers, held Sept. 13, by order of Capt. Buckle, senior officer at Boa Vista, in which it is stated, "*the extremely malignant character of the fever which has resisted the treatment usually found successful in the common endemic fever of the coast.*"—(Admiralty Correspondence, p. 48.)

By the opinion of Dr. Carter of the Growler, who, according to a letter from Capt. Buckle to me, considered "the disease among the Eclair's crew at Boa Vista to be contagious," and, "therefore, by his advice," adds Capt. Buckle, "I restricted the intercourse between the Growler and the Eclair as much as the pressing nature of the service would admit."

By the opinion of Sir W. Burnett and of Dr. Bryson, who, on the ground of the disease having become contagious at the fort, account for the attack of Dr. M'Clure.—(Admiralty Correspondence, p. 55.)—"Fevers of Sierra Leone," etc., by Dr. Bryson, p. 134.)

2. The petty officers and a few of the sailors did get leave after the arrival of the Eclair at Boa Vista; but there is no reason to suppose, that any of those who had this indulgence were at all sick. The officers who lodged in the house at Santa Barbara, on the beach at Boa Vista, were removed from it the moment they had even a premonitory symptom of disease; the house was exclusively occupied by them and their servants, and none of them when sick were nursed by the inhabitants.

3. The washerwomen who washed the linen of the officers (the crew of men-of-war do not send their linen to be washed on shore) were not infected by reason of the washing. But, up to this period, two officers only had been on the sick list from fever; one for a period of twelve days, and the other for eighteen days, both cases recovering. The clothes of one of these officers only were sent on shore. The bedding and clothes of deceased persons were carefully thrown overboard. Moreover, it has not been contended that the power

of fomites to propagate infection, is at all equal to that of intercourse with the sick.(a)

4. The labourers were not infected, nor did they infect their families while the Eclair was at Boa Vista; which is not to be wondered at, seeing that they had not, until the last, direct intercourse with the sick, although they mixed on duty with the small portion of the crew that remained healthy.

5. The Cape de Verds are within the yellow fever zone, and they have experienced severe outbreaks of epidemic fever; but never within the memory of man, either before or after 1845-6, was yellow fever known at Boa Vista, or at any of the other islands of the groupe.(b)

7. The physical and social conditions of Boa Vista are those which might originate fevers; but the theory of "localising influences," as applied to the yellow fever epidemy, signally failed, more especially at the Ravine of Rabil; where the alleged localising influences were in greatest abundance, there was the smallest mortality. Moreover, fever broke out at Moradinha, in the Ravine, where there was nothing like any appreciable, local, physical condition to produce it. The failure of this theory to account for the outbreak in July, 1846, was, if possible, still more remarkable; inasmuch as the fever on this occasion first appeared in one of the best ventilated and cleanest houses of the town, and the person first attacked was well supplied with the necessaries of life, and such was the case with the great proportion of cases that took place at this time. The disease for some time was confined to the very best part of the town. No rain fell until a month after the disease had re-appeared, and several cases had died before any rain fell.

(a) Few, I imagine, will agree with Dr. King when he says, in his "Report," p. 7, "If the disease possesses the power of reproduction, its poison must have been as certainly communicated through the medium of fomites, as by direct contact with the sick on board, or at the fort."

(b) Some of the islands of the Cape de Verds have, within the last two years suffered from ague and remittent fever; but in no part of the documents in my possession regarding the disease, is there any sign of yellow fever mentioned. No case of black vomit occurred. In fact, the disease was perfectly amenable to common treatment. My friend, Mr. Thomas Miller, recommended by the Governor-General to the Portuguese Government for the decoration of the Order of the Tower and Sword, for his conduct during the sickness, took forty people from San Nicholao to St.

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LONDON
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1881

How is the occurrence of these cases to be explained on the ground of a "localising influence," such as is alluded to in the "Report on Quarantine"?

These cases took place, not only in the cleanest part of the town, but in the cleanest houses of the town; there was no crowding; indeed, in the first case, the fine, large, airy house was occupied by one person and two native servants. The weather was beautiful; there was no rain for nearly a month afterwards, nor was there anything upon which to build even the slightest supposition of the existence of any epidemical constitution of the atmosphere at this period.

To assume that these cases were merely sporadic cases,—mere messengers sent to announce the near advent of another epidemic, may be a very convenient formula for the Board of Health by which to account for cases they cannot otherwise dispose of; but such a mode of explanation will not, I imagine, carry much weight with the Profession.

8. It is entirely erroneous to state, that yellow fever was prevailing at Porto Praya when the Eclair arrived at Boa Vista. No such disease prevailed at Porto Praya at this period, nor are there any grounds for supposing that it existed there at any other period.

9. With regard to the outbreak of the epidemics, both as regards 1845 and 1846, most severe and fatal cases had occurred before any of the alleged atmospherical or other phenomena had appeared. It is also to be borne in mind, that *the so-called sporadic cases occurred only in persons who had been exposed to a source of contagion.*

10. The epizooty did not take place until the end of the dry season of 1846, when the fever had well nigh left the island. The epidemy on the island of Boa Vista commenced on the 12th October, in the person of Anna Gallinha. Anna

Vincent, during the height of the fever at the latter place. Nearly all were attacked; but one only, previously debilitated, died. The Consul, in his letter, states, "that no family nor person having the common necessaries of life, or the means of common treatment, died." Had the disorder been of the nature of yellow fever, those who had the means of treatment and the necessaries of life in greatest abundance, namely, the Europeans, as at Boa Vista in 1845-6, would have suffered most. But the very reverse of this was the case, for the blacks suffered most—nay, almost exclusively. The disease, in short, was maintained by exposure to vicissitudes of weather, and by starvation.

Texeira, her son, Manoel Affonso, and others, living in the same neighbourhood, were attacked immediately afterwards.

At Rabil, the first case was Luis Pathi, about the 25th September, the disease attacking his family in the beginning of October. Manoel Fachina's wife, living next door, and visiting Pathi, was attacked at this time, and many others in the neighbourhood within a reasonable period from the arrival at Pathi. The exemption of the eastern villages, and of some of the other villages for some time, may be explained on the ground of their comparative little intercourse with Porto Sal Rey and Rabil, and partly also from the adoption of precautionary measures; but their exemption seems wholly inexplicable if the disease is to be attributed to a general atmospherical cause.

I think, then, that the whole of the "countervailing considerations" assumed in the *Summary*, at pp. 114-15, of the "Report on Quarantine," to be "admitted" facts, are, in every essential point, entirely destitute of foundation.

Such conclusions as those contained in this *Summary* could never, in my opinion, have been arrived at, had all the circumstances in the Eclair and at Boa Vista been fairly and impartially weighed. Nor do I believe, that they will be received by any one who will take into account the numerous mis-statements in the "Report on Quarantine," which I have pointed out and corrected, and the omission, in that document, of so many matters important to the elucidation of the truth, which I have taken leave to supply.

In my humble opinion, the history of the epidemy at Boa Vista comprehends every condition upon which the proofs of the infectiousness of a disease are supposed to rest, namely:—

The healthiness of the island before the arrival of the Eclair, with Yellow Fever on board.

The outbreak of the same disease among the inhabitants of the island within a reasonable period afterwards.

The immunity of distant villages for long periods until the arrival of infected persons, and the radiation of the disease in every district from infected foci.

The comparative immunity from the disease obtained by persons who adopted common but partial precautionary measures against infection.

The absolute immunity from the disease procured by persons who adopted strict measures of isolation and segregation.

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LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
1881

Before closing this communication, I am desirous it should be distinctly understood, that none of the observations I have taken leave to make on the "Report on Quarantine" are intended to apply to either of the lay members of the General Board of Health whose names are attached to that document.

There is one passage, however, (that in which, at p. 101, the inhabitants of Boa Vista were charged with "giving their evidence under the strongest feeling of self-interest," to establish a claim for compensation," etc.,) to which I cannot help regretting that they should have given even an official concurrence.

The inhabitants of Boa Vista, consisting chiefly, in fact almost exclusively, of the negro and mixed races, badly educated, in a great measure destitute of the benign influence of religion, living on a wretchedly arid soil, with the curse of slavery as part of their social system, are, it is true, generally "poor and miserable;" but it does not follow, that, even under these adverse circumstances, all virtue in human nature should be supplanted by fraud and dissimulation. I was in every village, and I spent much time among the people; and I feel assured, they gave their evidence freely and candidly; and to charge them with exaggerating their statements from selfish motives, I feel to be as unjust as it is ungenerous.

It is to me a matter of deep regret, to find the honoured name of Lord Shaftesbury, connected as it ever has been with noble and philanthropic sentiments and feelings towards the lower classes, *whether black or white*, of all countries, giving even official sanction to so unworthy an insinuation.

As respects the medical member of the Board, he is no longer young; he is a respected member of a Profession honourably distinguished for its humane character and tendencies; and it is said that, at a former period of his life, he exercised a higher and even more sacred function. From such a quarter, one might have expected some degree of caution in giving countenance to an aspersion against a poor, but industrious and generous people, which, on further inquiry, he might have found to be wholly unmerited.

It is, however, consolatory to know, that the Government of this country were in no degree influenced by any such ungenerous views. A handsome sum of money was transmitted by the British Government to the distressed islanders, which, with the donations of provisions from Portugal, from the late Mr. Macaulay, from the English Consul, from the Messrs. Miller, of San Nicolas, and other benevolent sources, must have relieved much distress, and proved the saving of many lives.

Judging from what I saw in 1846, when distributing to famishing women and children the large amount of provisions brought me by Commodore Jones in H.M.S. Penelope, and the liberal supplies also sent from Sierra Leone and the Gambia, I feel satisfied, that the bounteous charity of the British Government was met by the blessings and the gratitude of the whole population of Boa Vista.(a)

(a) Never was relief to a beleaguered and starving garrison more welcomely and thankfully received than were the provisions brought me by Commodore Jones, in H.M.S. Penelope. This bountiful and well-timed supply consisted of Rice, 210 large bags; Farinha de pao, 50 bags; Guinea corn, 50 bags; besides several boat loads of Yams.

I may, perhaps, be pardoned for yielding to the temptation to make the following extract from my private journal on the occasion of the first day's distribution of the provisions among the people:—

"With Dr. Almeida, the Mayor, Senhor Joao Baptista, and John Jamieson, employed the greater part of the day dealing out provisions to the people, who are in great want. It was a goodly sight to see their black, shining faces full of joy and thankfulness as they received their loads, varying in amount according to the number in the family. No Englishman could look upon this scene without being proud of his country. Thousands in this comparatively little known island are starving; no sooner is this known, than the gladdening hand of British generosity is at once extended to them. 1118 persons relieved this day. This is something to sleep upon."

Trinity-square, Tower-hill.

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International Medical Congress

ON

INSOLATION OR SUNSTROKE

BY

SURGEON-GENERAL SIR JOSEPH FAYRER
K.C.S.I., LL.D., F.R.S., Q.H.P.

LONDON
J. W. KOLCKMANN, 2, LANGHAM PLACE
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ON

INSOLATION OR SUNSTROKE.

The Sixteenth Annual Report of the Sanitary Commissioner with the Government of India being that for 1879, tells us that out of a force of 57,810 European soldiers in India in that year, there were admitted—

274 from sunstroke,
58 from apoplexy,

they are not bracketed in the returns as in the case of natives, but they may fairly be considered as etiologically linked, and due to the same cause—heat! Of these 116 died of sunstroke, and 12 died of apoplexy. It appears that out of a force in the Bengal Presidency of 37,337 men, there were 202 cases of sunstroke and 27 of apoplexy, with 93 deaths from the former and 8 deaths from the latter. In the Madras Presidency, out of a force of 10,574 men, there were 36 cases of sunstroke, and 14 of apoplexy, with 3 and 1 deaths respectively. In Bombay, out of 8,899 men, there were 36 cases of sunstroke, and 7 of apoplexy, with 9 and 3 deaths respectively. The Native Army of 130,011 men, had 40 cases of sunstroke and 26 of apoplexy, with 33 deaths from both combined. The jail population of 117,680 persons, had 102 cases of sunstroke and 44 of apoplexy, with 78 deaths from both combined. There were 4,640 European women belonging to the European regiments in India, and they had 12 cases of sunstroke and apoplexy, of these 10 died. There were 8,993 children of the European regiments and they had 7 cases of sunstroke with 4 deaths, they suffered much less than adults This disease, therefore, forms an important item in the general death rate of India, as it does, no doubt, wherever great heat is combined with certain other climatic peculiarities. These figures, representing the incidence of the disease among a certain class of persons, whose condition, history and circumstances being the subject of accurate observation, are valuable, as far as they go, but cannot be supposed to represent more than a very small part of the mischief and mortality caused by great heat. The returns probably represent chiefly, if not entirely, the cases of the more severe forms, in which the cerebro-spinal system was seriously compromised; but to these might be added cases of so-called ardent fever, a form of disease due to the immediate effects of heat, rather than to any other climatic influence; though, doubtless, malaria is frequently associated with high temperature. The conditions to which I would call attention are as follows: under the designation of sunstroke, coup-de-soleil, heat apoplexy, heat asphyxia, thermic fever, ardent fever, ictus solis, insolation, calenture, and erythismus tropicus, certain pathological conditions are included, which differ materially, though they are not unfrequently confounded with each other.

1st. There is syncope from exhaustion caused by heat.

2nd. A condition resembling shock caused by the action of the direct rays of a powerful sun on the head and spine. The nerve centres, especially the respiratory, may be affected; respiration and circulation fail, and death may, and often does, result!

3rd. Over-heating of the whole body, blood and tissues, either by direct exposure to the solar rays, or to high temperature in the shade; vaso-motor paralysis and intense pyrexia cause failure of respiration and circulation, and result in asphyxia.

Recovery is often incomplete, owing to molecular changes, which cause a variety of symptoms indicative of grave lesions of the nerve centres.

The first form, that of exhaustion, occurs during fatigue or over exertion, especially when the physical or mental powers are depressed. As in the case of stokers and engine-room men in steamers in the Red Sea, or other tropical regions, where the temperature of the air rises to 120° or upwards; also in that of men—especially Europeans—who are exposed to intense heat and light, in the *direct solar* rays.

Death may occur in this state from failure of the heart's action!—syncope. Again, during exposure to the direct action of a tropical sun, when the atmospheric temperature is high, and especially when the air is loaded with moisture, when the nervous energy is depressed by previous illness, over-fatigue, or dissipation, a condition of shock may supervene, the respiratory and circulatory centres fail through inhibition by the vagus—and death results. When in such case death occurs suddenly, it has been ascribed to rapid coagulation of cardiac-myosin; this, however, though it may occur, is perhaps more frequently a post-mortem change; the heart's action being really brought to a close by tetanic contraction of the ventricles, as shewn by Claude Bernard and Lauder Brunton, may be in the case of animals exposed to great heat.

I have seen, and have recently heard of a case in which evidence of cerebral irritation did not supervene until a day or two after exposure to the sun, when very grave symptoms developed, but happily passed away after prolonged illness.

Recovery in ordinary cases is frequently complete, but may be tedious and imperfect.

The symptoms of this form of sunstroke are in the outset like those of simple heat-exhaustion, only more pronounced.

The person becomes unconscious, or nearly so; there is a cold skin, feeble pulse, sickness, and all the symptoms of collapse and exhaustion; and in this condition, if reaction is not established, he may die.

As I have said, recovery most frequently occurs, though in some cases it is rendered incomplete by lesions of the nerve centres.

The third condition, or that which may occur quite independently of the direct rays—though it may happen also during exposure to great solar heat—is more severe and dangerous.

It comes on frequently at night, in a room or tent, especially in persons who are debilitated, or who are suffering from exhaustion or fatigue, dissipation or illness, or from over-indulgence in food or alcohol, or who have weak or fatty hearts, and notably when the air is impure from crowding or insufficiency of cubic space.

Such form a large proportion of the fatal attacks of so-called heat apoplexy. In India many die; more who recover, often do so only partially from secondary consequences—the result of tissue changes, destroying life or impairing health and intellect at a later period.

The premonitory symptoms may appear some hours, even days, before the dangerous condition sets in. There is general malaise and restlessness, insomnia, apprehension of impending evil, hurried, shallow or gasping, sighing respiration, precordial anxiety, giddiness, headache, occasionally nausea or vomiting, thirst, anorexia, fervent heat of skin, a disposition to frequent micturition and disordered secretions.

The symptoms becoming aggravated, the temperature rises from 106° to 110°; dyspnœa

increases; great restlessness; the head, face, neck, and skin generally become livid; pulse full and labouring; carotid pulsation very perceptible; pupils contracted—dilate widely before death. Coma, stertor, convulsion, often epileptiform, relaxation of sphincters, and suppression of urine are the precursors of death.

These symptoms indicate a profoundly disturbed state of the cerebro-spinal centres, whose functions have been so seriously interfered with. Death is caused by asphyxia and apnœa, it may be, complicated with cerebral hæmorrhage and effusion.

Recovery is often, indeed, one may say always, in this form, incomplete. The general health, even if there be no obvious cerebral lesions, remains impaired, the memory defective, and there is complete intolerance of the sun's rays or of great heat in any form.

To these may be added certain cases of fever—due to exposure to great heat—in which the temperature rises very high, and in some cases proves rapidly fatal. These are the ardent fevers, which are liable to be complicated with symptoms of malarial poisoning, and to have the remissions peculiar to that disease.

Intense heat is the cause of the conditions just described; and the degree in which it operates is more or less influenced by the hygrometric state of the atmosphere.

A dry hot air is better tolerated than a damp though cooler atmosphere. The dry hot winds of Upper India are less trying than the moist atmosphere of Bengal, or some parts of Southern India.

Dry heat favours perspiration and keeps the body cool; damp air, though cooler, represses perspiration, and thus diminishes the natural cooling powers of the body.

The state of health and acquired power of toleration and idiosyncracy influence the susceptibility to, and power of, resisting heat. Vigorous healthy Europeans, of spare frame, temperate habits, and who have sound viscera, can sustain a great amount of heat. Acclimatization has also some influence in conferring toleration; new arrivals in the tropics are more prone to suffer than those who have become accustomed to the climate, and have learned how to protect themselves.

A native can bear an amount of sun on his bare head and body with impunity—nay, with pleasure—that would prostrate a European. But when the temperature rises above a certain standard, all succumb, and natives suffer and die like others; numbers perish every year from "Loo Marna"—hot wind stroke.

Toleration of heat depends greatly on vigour of constitution, state of health, and mode of living; especially in freedom from excess in food and alcohol.

The refrigerating powers of the body in health render it able to support a very high temperature, provided transpiration is unimpeded by atmospheric moisture or other causes, and the air is pure. In the dry hot winds little inconvenience is felt so long as perspiration is free: but when from any cause that fails, suffering soon ensues, and the danger is great. The danger to life is great when the temperature of damp air rises above the normal body temperature.

The hot months of April, May, June and July are those in which the disease most prevails, and those who are most exposed suffer most. But, as I have already said, some of the worst cases are due to heat quite out of the sun's rays, for they occur at night, and in the close atmosphere of barracks, tents, houses, hospitals; and especially to those who are predisposed by debility, disease, or intemperate habits.

Men on parade, or when marching, if oppressed with clothing or accoutrements, are apt to suffer, and fall out fainting and exhausted. Soldiers, labourers, artificers, and others, in heated rooms, hospitals, barracks, tents, or ships, may suffer in this way, and in some cases pass into the dangerous state of asphyxia I have described, especially if they have indulged in excess of food or drink.

The more serious cases where cerebro-spinal mischief takes place, may also happen in these circumstances, though the greater part of these occur, as I have described, without the direct intervention of the solar rays. I find by reference to the Sanitary Commission reports that the sunstroke is pretty widely spread; that in the months of April, May, June, and July, it prevails most, and that there is no remarkable number of attacks at any one place, except at Mean-Meer, where among 899 men, there were 13 cases in July; at Nowshera, strength 630, there were 23 cases in June and July. In the Peshawur valley out of a force of 3,431, there were 28 cases in May; whilst in Malliapoorum, in Madras, there were 13 cases among 93 men, in May, 1879.

The deaths per 1,000 strength were,* in men of between one and four years service, 1·48; five to seven years, 1·50; at ages under 25 years, death rate 65 per 1,000; from 25 to 29, 99 per 1000. From 30 upwards, 2·33 per 100.

Though many who are attacked recover, or rather do not die, a large proportion are permanently injured, and become invalids for life, which is frequently shortened by obscure cerebral or meningeal changes that affect the sufferer in various degrees of intensity irritability, impaired memory, headache, mania or dementia, partial or complete paraplegia, partial or complete blindness, intolerance of the sun's rays, rendering a person otherwise fairly healthy, incapable of serving in hot climates or often during exposure to the sun; it may be, gradually ending in fatuity, dementia, or epilepsy, perhaps both chronic meningitis, with thickening of calvaria and intense cephalalgia, or in a lesser degree in disordered innervation and general functional derangement, which seriously compromise health.

Morbid Anatomy.

When death has occurred suddenly, as from syncope, or shock, there is no very obvious morbid change, but the heart may be found firmly contracted. In animals dead from exposure to a high temperature—*i.e.*, when the blood and tissue have been heated to 110° or 112° or higher—the heart has been found tetanically contracted in some cases, though in others it remained flaccid.

The brain and membranes and the lungs are sometimes, not always, congested. As in cases of shock from violence, the venous trunks, especially those of the abdomen, and the right cavities of the heart, may be full of blood which is dark, grumous, often imperfectly coagulated and effused in patches of ecchymosis, rendering the body rapidly livid. The coagulability of the blood is impaired, and it is deficient in oxygen.

In death from the more severe form of insolation, the lungs and pulmonic circulation are often deeply congested; the heart is firmly contracted, it may be, by coagulation of myosin, and the whole venous system is engorged.

The body, even before death, may be marked by petechial patches, or extensive livid ecchymosis. The blood is generally dark and grumous, and may be acid in reaction.

The globules are crenated and do not readily form into rouleaux. The body for some time after death retains a high temperature. When the body is opened, the viscera and interior feel intensely warm, hot and dark blood drips from the incisions.

Rigor mortis comes on rapidly. The brain and membranes may be congested; there may be cerebral hæmorrhage or effusion of serum.

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* Bengal . . . 2·61 per 1,000 died.
Madras . . . 1·44 ,, ,,
Bombay . . . 1·21 ,, ,,

Average 2·17

Table XII. European Troops, 1879.

Treatment.

Prevention: The great object is to prevent the occurrence of the disease. Careful protection of the head and spine from the direct rays of the sun by proper solah (pith) hats; light clothing, fine woollen is the best, should be worn.

Precaution against over-fatigue or exertion, either physical or mental, and freedom from excitement on the one hand or depression by fatigue or want of food on the other, is most desirable. Rooms should be well ventilated and the atmosphere kept as pure as possible by constant ingress and egress of air.

The punkah, thermantidote, and tattie should be freely used; and as much as possible men should avoid exposure to the sun, and fatigue or work during the hotter parts of the day; during the hot still nights, a most dangerous time, punkahs should be kept freely going, windows open, and the body should be protected by light woollen covering to protect it against sudden alterations of temperature.

Moderation in diet and drink is essential. Excess of animal food and alcoholic drinks should be scrupulously avoided; depression from want of food equally to be deprecated. A moderate amount of physical exercise and mental occupation should be encouraged; regularity in living should be enforced. No one more likely to suffer from insolation in any of its forms than he who has suffered from mental or physical exhaustion, or who has become habituated to the abuse of alcohol or of excess of food.

Men who are healthy and who lead regular lives will withstand heat, and preserve health in a measure that would be regarded as remarkable if contrasted with its effects on those who do not observe these precautions.

Having said so much in regard to prevention, I would make a few remarks on treatment.

In simple heat exhaustion, remove the patient to a cool place, in the shade if possible.

Douche with cold water on the head and chest, not too prolonged, so as to over depress. Remove all tight and oppressive clothing, apply ammonia to the nostrils and give a slight stimulant; if depression be prolonged or profound, treat as for an ordinary faint.

Place the person in a quiet place, and let him avoid fatigue or exposure to more heat as much as possible.

When a man is struck down by the hot sun, use the cold douche affusion freely; the object is two-fold—to rouse by reflex action and to reduce temperature.

During the assault on the White House Picket at the capture of Rangoon in 1853, in the month of April, numbers of men were struck down by the fierce sun. They were brought to the field hospital, and laid out in rows, quite unconscious; they were clad in thick red coats with leathern stocks (they wore them in those days).

They were treated with free douching with the Bhisty's mussuck, and all recovered except one or two who had been bled when they were struck down.

In one case, that of a general officer, flagellation with a sweeper's broom was effective in rousing. Mustard poultices to the body and legs, and stimulating enemata, with a diffusible stimulant by the mouth, in some cases were useful.

When I say such cases recovered, I refer to the reaction at the time. In some there were consecutive symptoms of fever, cephalalgia, &c. And, could we trace their subsequent history, it would probably be found that complete recovery never took place, but that some chronic intra-cranial mischief was established.

Exposure to the sun should be carefully guarded against in future; and, unless recovery has been complete and rapid, the sufferer should be removed to a colder climate, where he must be protected from all excitement, mental or physical, and continued care must be taken to prevent excess of every kind. In severe cases of thermic fever, the

object is to reduce temperature as speedily as possible, before tissue changes have taken place. The hyper-pyrexia is due not only to the direct action of heat on the tissues, but to pyrexia caused by vaso-motor disturbance, and therefore quinine and morphia used hypodermically have been thought to produce good results by their power of reducing blood pressure. The quinine probably may do so, the advantage of morphia I should think questionable.

Bleeding has been abandoned, except in rare and exceptional cases. The congested livid skin, the coma and stertor which suggested it, do so no longer, as a general rule, though there are cases where it may be necessary to relieve a labouring right heart, and prevent suffocation. In ordinary cases, though temporary relief may have been afforded by it, the improvement has been transient, and followed by relapse into a more dangerous condition.

No absolute rule should be laid down in this or any other disease; it may, for reasons above mentioned, be the lesser evil, and therefore adopted.

Each case must be treated on its own merits. Treatment generally consists in cold affusion and the application of ice, care being observed not to reduce the body temperature too low. A thermometer will guide in this respect.

Depression of the body temperature below the normal standard for long would be dangerous, and therefore should be avoided. The bowels should be relieved by purgatives or enemata.

Sinapisms to chest may be useful.

Blisters are sometimes applied to the neck, but rarely, I should think, with any benefit. In the epileptiform convulsions, inhalation of chloroform may be useful, but it must be carefully watched.

The earliest and most severe symptoms having subsided, the fever which follows must be treated on ordinary principles. As the case progresses, symptoms of intra-cranial mischief may supervene, indicating meningeal inflammation. Iodide of potassium and counter-irritation may be of service. As a rule it is most desirable that one who has so suffered should not return—at least for a considerable period after he has apparently recovered—to a hot climate, and that he should always be guarded against heat, overwork, exhaustion, anxiety, and errors in diet.

The sequelæ of sunstroke are often very distressing, rendering the patient a source of much anxiety to himself and to his friends.

The less severe symptoms, such as those of the slighter form of meningitis, or of cerebral change, occasionally pass away after protracted residence in a cold climate. They are, however, frequently the cause of suffering, danger, and shortening of life, and form some of the saddest proofs of the danger of residence in tropical countries.

The time at my disposal is too short to allow of justice being done to the various authorities on this subject. Had it been otherwise, and these remarks had extended beyond a few practical observations, the outcome of personal observation in India and Burmah, I should have referred to your own valuable contributions; and to those of the late Mr. M. Hill, and of Dr. Barclay, to the valuable description by our own and highest authority on all tropical disease, Professor Maclean; but especially to the thoughtful, scientific, and most valuable work by Dr. H. C. Wood, of Philadelphia, a monograph which contains a most exhaustive description of the etiology, pathology, and treatment of insolation in all its forms or phases.

DISCUSSION.

Inspector General Maclean, Netley: objected to the use of the term apoplexy applied to this disease, as wrong in pathology and leading to grave errors in practice. Dr. Maclean adverted to the danger of tight clothing and accoutrements, and gave a striking example of this in the case of the 98th Regiment, where the men being dressed, when called on for exertion at a military operation in China, in tight clothing and accoutrements, had great mortality from sunstroke; while two other regiments, dressed in a more easy manner, did not suffer at all. Dr. Maclean touched on the effect of exhaustion after long marches leading to suppression of the action of the skin and kidneys, and of alcohol in increasing the liability to insolation. Dr. Maclean then gave some interesting historical examples of the disease in European armies, particularly in the case of a famous march of Frederick the Great, who lost 150 men in one day from this disease, Field-Marshal Dawn on the same day having also lost 200 men from the same cause.

Dr. Norman Chevers, London: referred to the prevalence of sunstroke in India and America. It is most important that we should observe and define individual constitution in sunstroke. A surgeon who has served in the tropics is warned by his own sensations that on certain hot days cases of sunstroke will occur; but, on sunstroke days, only those who suffer from some constitutional fault are liable to be attacked. Many cases of so-called insolation are really cases of malarious fever, the hot stage happening to occur on a sunstroke day. Many cases of sunstroke are really cases of alcoholic poisoning. Some are cholæmia or uræmia, or both. Some are cholera. I have never seen extravasation of blood, or true apoplexy, in these cases. It is a prophylactic necessity to prevent cutaneous action from being checked by any cause except cold. Are the Mongolian people of India liable to sunstroke, or are they exempt as negroes are?

Dr. Christie, late of Zanzibar, during some years' experience of the sequelæ of sunstroke, is satisfied that its after-effects are not sufficiently understood. In a large number of cases, after an attack, the mental capacity is so far interfered with as to render a man quite unfit ever to return to a hot climate. The pathological changes fully bear out the views of the author of the paper. In three or four cases I have met with a remarkable growth of spiculæ of bone from the skull, with thickening and opacity of the membranes. In one case epileptiform convulsions, with complications of mania, resulted.

Dr. Yandell, Louisville, Kentucky: I quite agree with my learned friend as to the several points so well put in his very excellent paper on sunstroke. In America, the white race suffers much more than the black from sunstroke. The negro bears the sun's heat better than the white man. Whether this is due to what is supposed to be the greater activity of the negro's skin, or not, I am not prepared to say. The negro who works in the harvest field and in the cotton field very rarely suffers from sunstroke. When he removes to the city, and there lives in crowded houses and close rooms, and is subjected to the same influences which demoralize the white man, and becomes loose and irregular in his habits, committing excesses in eating, but more especially in drinking, he then becomes liable to sunstroke. Yet the negro remains under even these circumstances better able to withstand the evil effects of heat than the white man working by his side. I do not remember to have seen a genuine sunstroke from which the individual ever perfectly recovered—some twist, some evil remained. His physical strength, his mental force, his moral powers, were lessened or altered. As to treatment, the profession in America was fairly agreed that cold, applied so as to reduce the temperature in the quickest possible manner, was in the main most likely to be successful.

Surgeon Major STAPLES, A.M.D.: I served at Nowshera, one of the stations mentioned by Sir Joseph Fayrer as having a bad reputation for heat apoplexy, or insolation, and I witnessed there in 1867 an epidemic of the disease. A history of that outbreak was published in the *Army Medical Reports* for the year 1868. Before I refer to it, however, I should like to say a word concerning the other conditions under which the author of the paper has considered the effects of heat in the tropics; and firstly, as regards heat exhaustion. Instances of this, with insensibility, are less frequent in India than might be supposed, but I can recollect a very characteristic case. In the hottest part of the year 1875, I, with two other officers, accompanied the then Lieutenant-Governor of Bengal in a ride from Shillong to Gowhatti, in Assam, a distance of over sixty miles. We started after early breakfast, and the journey was completed in about eight hours. All was well while we galloped through the Shillong uplands, but when we descended into the lower ranges bordering the valley the heat became intense, and one of the party (a very stout officer of police) soon showed signs of exhaustion. He persevered, however, but after some miles in a narrow and close valley he succumbed, and fell from his horse insensible. I came up in three or four minutes, and found him quite unconscious, very pale, and breathing heavily. Fortunately a stream ran close by, and taking his Ellwood helmet, I filled it with water and douched him freely over the head and chest. After a few such applications he became completely conscious, and after a little rest was sufficiently well to be brought into Gowhatti in a dog-cart. The above is a good example of exhaustion from great heat. Clinically, it is of value, as pointing to the condition of the heart—viz., loaded with fat, judging from the rest of the body. Death by syncope from heat would appear to be but an aggravated form of the foregoing. In Bareilly (Rohilkund), in the hot season of 1871, on a very close morning, a soldier of the 25th Regiment, while employed in the regimental workshop, becoming overpowered by the heat, suddenly fell down and expired. I saw him within a minute, but life was completely extinct. I found upon inquiry that he was not previously considered to be in ill health, but a post-mortem examination discovered a very fatty heart. There was no other lesion whatever. Sunstroke, so-called, or that condition where men are suddenly struck down insensible by the sun's rays, I have never seen in India, but I have met with cases in this country. They occurred in soldiers who had previously served in India, and who had suffered from malarious fevers in that country. In one case which occurred on parade at Woolwich in 1877, the return to consciousness was very slow, and was accompanied by insomnia and by loss of recent memory. The man could give an account of himself up to the time of being struck down, but of what happened to him afterwards his mind was a complete blank. This lasted for a couple of days, and ultimately yielded to full doses of potassium bromide. The pathology of this condition may, perhaps, be likened to shock or concussion from other causes. Insolation has appeared to me to depend not so much upon an accidental rise of temperature as upon a prolongation of a high temperature. This was the case at Nowshera, in 1867, when the hot winds blew without intermission, day or night, from the 19th to the 30th of June, the thermometer remaining for the greater part of that time above blood heat. I thought I could recognize premonitory symptoms in nearly, if not all, the cases, and my conclusion was that the surgeon's best efforts should be directed to their treatment, and thus to the prevention of the disease, for the latter appeared, when fully developed, to be little amenable to treatment. I have only further to call attention to the remarks of some previous speakers, who have laid stress on the fact that no blood is found in the brain in this disease, post mortem. No doubt this is accurate; but yet it should not be forgotten that blood serum is usually present in the brain ventricles. If the case soon terminates fatally, the quantity is small; but if, on the other hand, the case is a prolonged one, the amount will be considerable.

Deputy Surgeon General EWART, Brighton: wished to call the attention of the meeting to the importance of employing cold iced baths in the treatment of heat-stroke, for the purpose of reducing the temperature of the body. At the general hospital in Calcutta he had thus seen patients restored from profound insensibility to consciousness in a few minutes. The bath is only applicable where there is augmented temperature. It is useless in *coup-de-soleil*, where at the beginning there is a collapse and reduction of temperature from shock and paralysis of the great nerve centres.

Sir JOSEPH FAYRER, London: thanked the meeting for the manner in which they had received his paper. All confirmed what he had said. There was nothing to reply to, excepting that probably Mongolians, if exposed to the same amount of heat in the hot winds, would suffer like other natives of India. Dark races bear the direct rays of the sun better than Europe ans, but, if exposed to a high enough air temperature, suffer like others.

The PRESIDENT: Dr. Chevers has asked me to make some observations on the cases of sunstroke respecting which I published a paper while in India. My observations on sunstroke in India were made only in one locality—viz., in Barrackpore. On the other hand, the results of experience in this trying affection, under almost every kind of exposure and in all the chief parts of India, have been brought before the meeting by surgeons of the highest eminence and of the greatest experience in tropical diseases, and I feel I should be taking up the time of the meeting with little advantage if I were to attempt to prolong the discussion which has been so ably conducted by others who have had a far wider field of observation of sunstroke than I have had.

Duplicate copy

Dr. Maclean

with Dr. Fayrer's compliments

APHASIA AND DEATH RESULTING FROM SOFTENING IN LEFT ANTERIOR CEREBRAL LOBE AND CEREBELLUM, DUE TO ATHEROMATOUS DEGENERATION AND EMBOLISM OF THE CEREBRAL ARTERIES.

By J. FAYRER, M.D.,

Professor of Surgery, Medical College, Calcutta.

The following very interesting case appears to corroborate the views recently advanced by certain pathologists as to the cause of loss of power of speech, or of the memory of words; it is also very remarkable as an example of cerebral softening, at a comparatively early age, from atheromatous degeneration of the vessels of the brain, with embolism of the basilar artery. I therefore give the notes I made of it, before and after death, in detail.

I have known Mr. —— for several years, and until three years ago his general health was good; he is about 42 years of age, of a nervous, excitable temperament, and of energetic and active habits of mind and body. About three and a half years ago he consulted me concerning one or two sores on the leg, which were of a suspicious character, and which he seemed to consider might owe their peculiarity, if not their origin, to a constitutional taint; if so, the disease must have been contracted in early youth, for he denies the possibility of any infection for many years. His habits and mode of life have been temperate and active, his occupation necessarily exposing him to frequent change of station, with much of his time spent in the open air. I did not attach so much importance to the sores as he did; they readily healed with rest and simple applications. But I prescribed iodide of potassium, with reference to the possible specific origin. In September, 1863, I was

informed that he had been attacked, suddenly, with hemiplegia of the right side, and have since seen the following note :—

"*January 7th*, 1866.

"My Dear Sir,—Mr.——had a stroke of paralysis in September, 1863, for which I gave him a certificate home. He returned to India in June last very much improved in health, so much so, that I was particularly struck with his strong healthy appearance.

"About a couple of months after his return he suffered for some days with a severe headache, which fixed itself in the back of his head, and though I could get no definite description from him of the nature of the pain, yet I could see from his restlessness, both during night and day, that he suffered a good deal. A few days' rest and quietude within doors and some mild treatment restored him to health to a certain extent, but not to the state he was in when he returned to this country. He went out on a long tour of inspection, and I dare say was not as careful of himself as he should have been ; but a few days after his return, he had a return of the headache; he had great nervous tremor of the hands. His memory (of which there was previously some failing) had now fallen off in a very sudden and marked way ; he used to remain in a half-dreamy, half-drowsy state all the day, sit to meals in this state, and talk as if he had not quite awaked from sleep. He partially recovered from this state, in fact quite enough to set him thinking about his duties, and he, strongly against my advice, left this on a tour in the Orissa country ; he has not yet returned, but his Baboos tell me he will be back about the middle of the month.

"I have now quite made up my mind that he is not fit for further service, but I shall, in the first instance, and that will be so soon as he returns to the station, give him a medical certificate home ; any steps that are necessary for his retiring from the service may very well be left for future consideration.

"Yours, &c., &c., &c.,
"*Civil Surgeon.*"

He had, apparently, no warning ; the attack occurred during the day, when he was talking to some one. He appears for a time to have lost all power in the right side, though he retained consciousness, but this paralysis was not of very long duration. He recovered partially, and subsequently regained power in his limbs ; his speech improved, though some thickness, slight difficulty of articulating certain words, and a quick and excited mode of speaking remained. He was most judiciously treated ; no depletion was had recourse to, and his powers were husbanded as much as possible.

In 1864 he went home to England, round the Cape, and on the voyage he appears to have been subjected to much anxiety and excitement from the danger to which the ship was exposed in a gale of wind, which required that she should be taken into port in the Mauritius and there detained for some weeks. It does not appear, however, that he suffered from this exposure ; on the contrary, his health and strength improved with the change, and the improvement was further confirmed during his residence of fifteen months in England. He returned to India in June, 1865, and I saw him soon after his arrival ; he looked well, and all traces of hemiplegia, so far as the limbs were concerned, had passed away. His voice, however, was still slightly affected ; there was an indistinctness in the articulation of certain words ; there was also an unnatural rapidity of utterance. His intellect seemed perfect, and he resumed his appointment. As the hot weather came on, he appears to have begun to fail ; his memory became defective, his manner excited, and his speech more rapid and uncertain. There was a tendency to forget, or to substitute words, and his intellectual powers, naturally great and much developed by scientific and literary study, to show signs of failing.

On one occasion I was asked to see him when he was in Calcutta, and I found his manner excited, his speech quick and somewhat indistinct. His memory was evidently on the strain, and though I could see no absolute indication of the original disease returning, it was evident that some permanent defect remained, which, under the excitement of heat and duty,

was becoming more marked, and indicated that cerebral change (whether dynamical or structural was uncertain) was at work.

23rd March.—A few weeks ago I heard an unfavorable report of him; there were no details beyond the fact that his memory was altogether gone. On the 8th of April I was asked to see him here; he had been sent in from ——— on his way home. The accompanying statement of his case was subsequently forwarded by the medical officer who had seen him during his last attack; and it clearly explains what happened shortly before he came to Calcutta.

Dr. ———'s Statement.

"Mr. ——, aged 42 years, has been in India fourteen years.

"On the 23rd March last I was called to attend Mr. ——. On my arrival I found him insensible, with a small pulse, pupils dilated, breathing easy, at times muttering to himself the most absurd nonsense; his breath was extremely fœtid. No paralysis, but slight convulsive movements of the right side of the body. His servants informed me that Mr. —— had been accustomed to fits of drowsiness, and on one occasion, I am told, he slept for three days. I was further informed that his bowels were not moved for three or four days.

"The Sub-Assistant Surgeon, who was called in before my arrival, had cut off his hair and applied cold. We then gave Mr. —— an injection of ol. ricini and turpentine, which acted once; he was further given a couple of calomel and colocynth pills with croton oil, and mustard plasters applied to the nape of the neck. Next morning he had a strong dose of senna mixture; this produced one very copious evacuation.

"During the day I found him better, *i. e.*, he was able to walk; he could not recognise people at once, but did so after an effort. On questioning him he gave a reply, but it was all nonsense; he improved a little, and on the 5th April I sent him to Calcutta.

"I treated him principally with purgatives; every blister failed, partly from his obstinacy, partly from their uncertainty of action. I also gave him small doses of mercury, partly as a

purgative and partly to affect his system; this last did not occur. I made him pass his urine daily in my presence, to satisfy myself as to the state of his bladder; the urine was thick and very ammoniacal in smell. All this time I kept him up with light nourishing food. When he left me he was able to walk; he had an appetite, could recognise people, and could answer questions very rationally; but if he attempted to carry on conversation he was lost; it was quite apparent his memory was affected.

"Of his previous history I know nothing. I am told he suffered from an attack of apoplexy and subsequent paralysis. There are marks near his joint as if he had been bled. I am fully convinced and am of opinion that Mr.——'s brain is most seriously affected, and I am further of opinion that this present attack is a continuation and result of his previous attack of apoplexy or paralysis. Under these circumstances, I now beg to recommend him for leave of absence for eighteen months, to go to England."

I found him looking remarkably well, as to physical health, stouter and stronger than I have ever seen him. The right hand grasped as powerfully as the left; the legs were equally strong. The tongue was protruded perhaps a little to the right side, but the cheeks, lips, and eyelids were all perfectly natural. The voice not thicker than before; the words articulate, but the speech altogether incoherent. The expression of countenance and the pupils natural; no look of fatuity, insanity, or imbecility; he at once knew and seemed pleased to see me. He was accompanied by a nurse, who says that he eats and sleeps well, and that he is perfectly quiet, tranquil, and easily managed. Indeed, but for his shaven head and incoherent speech, it would be difficult at first sight to believe that he is so ill as he really is. His condition is indeed one of great urgency, and there is reason to fear that some structural change, degeneration, or softening in the cerebral lobes is taking place. The prominent symptom at present is loss of memory of words—"Aphasia" as it has been designated by

Trousseau and other pathologists. It is difficult to say how far the intellect is affected; but certainly the main difficulty manifested is the utter inability to give utterance to more than the first few words of a sentence. He seems perfectly to comprehend any question that may be put to him, and makes an attempt to reply; but the first three or four words have barely found utterance before he lapses into the most incoherent and purposeless jargon, which appears to indicate that the memory of words is not only lost, but that ideas in the wildest and most incoherent jumble supervene on the forgotten sounds.

During the recent very hot weather he has shown some restlessness and impatience of control, wanting to go out and refusing, to remain in his room. But he is easily persuaded, and with me he is cheerful and gentle in the extreme; indeed, were one only to see him, and hear only his reply to such a question as "How have you slept?" or "How do you feel to-day?" it would be difficult to believe that anything was the matter.

He takes a walk or a drive with a friend every evening.

His attempts at writing are as incoherent as his speech; and a note I received the other day was barely legible or intelligible.

His appetite is good and his secretions are tolerably natural. A tendency to constipation is obviated by a croton pill, and cold to the head seems to be grateful and soothing. His pulse is natural and his digestive organs in tolerable order. The tongue has a tendency to be coated, and the breath to be offensive, but the aperient removes or, at all events, improves these conditions.

The nurse says that he occasionally wets his bed, and once or twice he appears to have forgotten where he was emptying his bowels; but there is neither incontinence of urine nor feces. A cold bath, the douche or shower-bath is given every morning, and this, with cold to the head, quiet, the removal of any cause of excitement, (mental or physical), and a regulated diet is all the treatment that has been adopted since he came here. There can be no doubt that the heat aggravates his condition; he is more incoherent and more restless under its influence, and less patient of control. I cannot help fearing, though I do not feel certain, that this is more than mere functional disorder, and that

such changes as have been described by M. Bouillaud, Trousseau, Dax, Hughlings Jackson, Saunders, and others, are taking place in the anterior cerebral lobes, and that these changes are the continuation and results of the cerebral disorder that was manifested three years ago in a transient attack of hemiplegia. Without in any way insisting on the connection between the conditions, in the relation of cause and effect, it is right to bear in mind the possible connection that the suspicious patches of ulceration formerly alluded to may have with the pathological condition of which the symptoms described are the manifestations. It is possible that the symptoms may be the result of merely functional disorder, but the previous history is opposed to the theory.

April 30th.—He has been doing well, much as I have reported, until last night. The nurse reports that at midnight he was sick; that he became more peculiar in his manner; passed urine in bed; was more incoherent and seemed to have more restless or irregular movements of the limbs; was quite conscious, and answered all questions as usual. I find him in the morning with a peculiar expression of countenance, the eyes partially closed, his body and limbs partially curled up in bed. His head was cool, pulse quick, tongue clean, bowels confined. Ordered an enema. He had had a pill at bed-time. I observed that the right arm was more rigid than the left, and that he used the left most; he could grasp firmly with the right, but he could not control the movements, and when he wanted to move it, he had to drag or lift it with the other hand. He was cheerful as usual, laughing and trying to joke, but unable to remember his words. I ordered ice to the head, rest, quiet, and a purgative.

Vespere.—The same condition; the nurse thought perhaps a little better; but I observed that rigidity and loss of control, not of power, was greater. He was quite conscious; said he felt the right arm was not right; but in a moment was more incoherent than ever, not remembering the whole of a word. The leg is not affected, the pupils are natural, and the pulse is slow and regular. Voice is natural, that is to say, no signs of paralysis, so far as it is concerned.

Ordered—A croton pill, blister to the scalp, and plain but nourishing diet.

May 1st.—He is no better; the bowels were moved freely, and the enema acted. He has had a restless night; has passed urine in the bed, and when he speaks is quite incoherent. I find him looking much the same. Right arm and fore-arm more rigid, but the wrist flexible; he cannot use it freely, aiding its motion with the other hand. The right leg is also feeble, and towards the afternoon it became more so. He understands all that is said, and answers in a peculiar half-sleepy and incoherent tone. He keeps his eyes half-closed, and the eyebrows contracted; the pupils are natural. His face looks less intelligent, heavy, dull, and oppressed. The blister on the scalp has risen. Pulse varies from 60 to 65; it rises with any exertion. Temperature of body natural. I directed nourishment—beef tea—to be given frequently; and the enema and pill if the bowels do not act again. Cold to the head; blister to be kept open.

His brother said that about noon he appeared to become more conscious, and became much affected, saying it would soon be all over. I expressed my fears to-day that he could not last much longer.

2*nd.*—No improvement; the arm and leg are still rigid. He quite understands what is said and tries to give an answer. Bowels have been freely moved; has taken nourishment. Keep the blister open; cold to the head. Repeat the enema in the evening, and give another pill if the bowels are not freely moved. Eyes closed, but opens them when told. He replies in a few incoherent half-formed words to what is said, but it is difficult to make out how far he is conscious. The head is cool; pulse 60; skin natural in feeling and temperature.

3*rd.*—This morning I find him changed, and the change appears to have commenced about 9 p.m. yesterday. He is lying in the most profound sleep, snoring occasionally. The limbs are certainly more relaxed than they were, and the rigidity in the right arm is diminished. His mouth is closed, and he has taken no food. The enema operated freely. Pulse 60;

skin cool; thermometer 98° in axilla; pupils natural—if anything, slightly contracted; but they respond freely to light. He is quite quiet, and has not spoken. He opens his eyes partially; makes a feeble effort to protrude the tongue when spoken to, which shows that he is still partially conscious.

Ordered—Beef tea enemata; food by mouth, if he can open it. Keep the blister open; ice also to head.

Vespere.—I find no change; he is as he was in the morning. The urine is passed in bed.

4*th.*—He is no better; much in the same condition; more comatose, if anything, but still appears to recognise the voice, for he opens his eyes when told to do so, though he makes no other sign. Enema and nutrient enemata return as given. No food has been given by mouth, for he cannot swallow. Face congested. Pulse 112, feeble.

5*th.*—He is much the same, if anything, weaker. Pulse 112; urine passed freely; bowels have not acted.

Ordered—Calomel .. .. gr. x
Elaterium .. .. „ ½
in butter.

There is rather less stertor; pupils act freely; opens his eyes when asked to do so; draws up the legs when they are pinched.

6*th.*—Bowels have acted; blister risen; he is much in the same condition; coma perhaps less profound; pupils act freely; he opens his eyes when spoken to. It is very difficult to get his mouth open, and any attempt at swallowing seems to cause spasm.

Repeat calomel and elaterium; nourishment as before by enemata. Beef tea and Brandy; food by mouth when possible.

7*th.*—Much in the same state; skin hot in afternoon; pulse quicker; less stertor; has taken some broth with great difficulty; does not seem so conscious as he was; hardly opens his eyes when told to do so. Let him have iodid: potass: gr. v. every three hours; nourishment as usual. His pupils are perfectly sentient.

8th.—Much the same ; pulse 120, rapid and feeble ; pupils still quite sentient ; involuntary discharge from bowels.

9th.—Weaker ; symptoms the same ; a sort of catch in inspiration ; pulse 140 to 160 ; involuntary discharges. Death at 5-30 p.m.

POST MORTEM EXAMINATION (13 hours after death.)

The body was well nourished. The head, which was remarkably well formed, had been shaven, and marks of vesication existed on the scalp.

Head.—On opening the cranium, a small quantity of opaque fluid was seen lying under the dura mater; underneath the situation of the blister, the vessels of the dura mater and corresponding bone were somewhat congested. On removing the brain from its attachments, opaque, but not inflammatory, exudation was observed in excess about the fissures of sylvius and generally in the subarachnoid space. When the dura mater was completely removed, and the brain turned with its inferior surface upwards, the whole of the inferior surface of the left anterior lobe of the organ appeared shrunken and smaller than that of the opposite hemisphere. There was also noticed matting together of the convolutions on each margin of the fissure of sylvius on the left side. Just on the antero-lateral aspect of the left corpus striatum in the nerve matter, intervening between that ganglion and the convolutions, there was a portion of yellowish and softened brain, from which, when cut into, a small quantity of opaque serous fluid escaped. The size of the cavity remaining after the fluid flowed away was about that of a pea ; and this, in all probability, represented the centre of the mischief which produced the hemiplegia, and interference with the faculty of speech three years ago. But now there was observed somewhat extensive white softening all round this spot, affecting the convolutions on the one hand, and the anterior portion of the corpus striatum on the other. The softened brain here contained granules, broken down nerve tubules, and nerve vesicles, but it was mainly composed of fat globules of variable size.

On the left and inferior aspect of the pons varolii, a portion of white softening, as large as a hazel nut, existed. The nerve structures were so altered in consistency that on pouring water on the part, the softened material was washed away, exposing a breach which penetrated the transverse or commissural fibres, the upward fibres from the corpus pyramidal, and the vesicular continuation of the olivary ganglion. But the whole structure of the pons—the medulla oblongata and crura cerebelli—was softer than natural.

The disorganized nerve substance of the pons was found to be constituted of a great quantity of granular matter, a few stray tubes and vesicles undergoing disintegration, and abundance of fat globules of different sizes. Neither in this nor in the softened part of the left anterior lobe could a single exudation corpuscle be seen.

The arterial circulation was examined with care. The vertebrals and basilar were thickened, rigid, and of a yellowish opaque colour from atheromatous or fatty degeneration. At the commencement of the basilar, the thickening of the vessel was so remarkable as to narrow its calibre most materially. It felt hard, like a piece of cord to the touch ; on laying it open here, its internal lining was opaque and roughened, having lost its brilliancy and smoothness. Immediately on the distal aspect of the atheroma, a dark-coloured clot of recent standing was seen completely blocking up the artery, and thus cutting off the normal supply of blood to the cerebellum, pons, and the posterior lobes of the brain on both sides, until a supplemental supply could be furnished by the internal carotid arteries, through the anastamotic system of the circle of Willis.

The whole of the primary and secondary arteries of the cerebrum and cerebellum were more or less spotted with a yellowish coloured atheromatous material. It was most characteristically developed, however, in the vessels on the left side of the brain.

The heart was flabby, aortic valves healthy ; but the ascending aorta, the curtains of the mitral valves, the innominata,

left subclavian, and carotid all contain atheromatous material.

For the above description of the post-mortem appearances I am indebted to Dr. Joseph Ewart, Professor of Physiology, and Pathologist to the Medical College. He and Professor Partridge, who saw the case with me, were good enough to assist me in conducting the examination.

REMARKS.

This case is one of great interest and importance. I have not been able to ascertain that there was any hereditary tendency to disease, either of the vascular or nervous systems; and the history of the patient, previous to the attack of hemiplegia, three years ago, tells only of a sound mind in a sound body. His mental and physical vigor were both remarkable, and although he was always of an excitable and vivacious disposition, there was nothing in the least suggestive of any organic or structural disease.

On hearing of the attack of hemiplegia three years ago, and learning that it was not in any way connected with recent exposure to the sun or to great heat, I was at a loss to account for it, and my thoughts reverted to the ulceration of doubtful origin as suggestive of a constitutional cause. I also thought of embolism, but not having the least idea that he was the subject of any vascular unsoundness, was equally unable to account for it on those grounds. I happened to know that the cardiac sounds were natural, and that he was free from any indications of valvular or other form of heart disease.

That a small vessel had given way, and temporary hemiplegia resulted from the pressure of a small clot in or near the left corpus striatum, was the last conclusion at which I arrived, and the subsequent history, up to his return to duty, appeared to support that conjecture.

The post-mortem examination proved that it was even more than that. The universally diseased condition of the arterial system, and the extent to which it had proceeded in the cerebral vessels, fully account for all, not only the past, but the recent symptoms.

The arteries of the brain—especially of the left side, and more especially those of the posterior part of the encephalon—the vertebrals and the basilar were diseased to a degree that I have never before seen. The vessels of the left side were unusually thickened and irregular from atheromatous deposit, and the basilar itself was completely plugged with a colored but firm clot. This, no doubt, was of very recent origin, and dated about the period when he passed into a state of almost perfect insensibility some days before his death.

The gradually progressive disease of the vessels had, no doubt, so far interfered with the circulation generally, through the left side of the brain, as to induce the gradually increasing symptoms of cerebral softening to which his history points as having been present, and the probability is that other and smaller embolisms have, like that of the last attack, formed from time to time, and compromised the nutrition of the brain, though not occurring in the vicinity of, or where they immediately affected, the cerebral ganglia. The effects were not so striking as in the first case, where either a hæmorrhage or an embolism directly affected the left corpus striatum.

The cause of embolism, no doubt, lay in the roughened coats of the diseased arteries. As the atheromatous degeneration gradually increased, disorganizing the smooth epithelial lining of the tube, the blood could hardly flow over it without leaving fibrous deposits or coagula, which in their turn, being washed away by the current, were carried into smaller channels which they plugged, and thus the blood itself became the source of the mischief. The recent large embolism in the basilar artery—the result of contact with the roughened and diseased vertebrals—is only an example, on a larger scale, of what probably occurred years ago in a smaller vessel of the anterior lobe, and no doubt often, more recently, in the cerebral circulation generally, until finally the starvation of the medulla oblongata precipitated the fatal event. It is interesting, in reference to the observations of the distinguished pathologists whose names I have already mentioned, to note that the lesion in the first place seemed to fall on the left anterior lobe, and that

certainly a marked feature in his case throughout, was affection of the speech; for even after the first attack, though perfectly recovered in all other respects, there remained some peculiarity in his speech—a rapidity of utterance, and a tendency to forget or to substitute words that was quite unnatural. As the wasting of the brain substance proceeded, this condition of *aphasia* also tended to increase, until just before the occurrence of the last fatal embolism of the basilar artery it had become the most marked feature of his condition, and pointed to what we had feared must prove to be irreparable mischief in the brain.

The arterial disease must, no doubt, therefore be regarded as the cause of mischief; it is remarkable that it should have gone to such an extent at the comparatively early age of 42.

The aorta was literally one mass of atheroma. There was more diseased than sound tissue, and it is probable that the same condition existed throughout the body, although no local gangrenes had occurred to give evidence that it was so. In all other respects he was in remarkably good health, being fatter and more muscular than I had ever seen him, within a fortnight of his death. His organs generally were sound; lungs, liver, spleen, and kidneys performed their functions naturally; the heart's action was normal in rythm and sound; and his pulse was steady and regular. The atheromatous degeneration of the arterial system appears to have been a constitutional peculiarity, and to it must be assigned the disturbance in the circulation which resulted in the pathological conditions I have described.

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5, COUNCIL HOUSE STREET.

CARDIAC EMBOLISM.

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When a patient who has suffered from a serious injury, or who has undergone a severe and protracted surgical operation, succumbs within a few hours after it, we have no difficulty in assigning the cause of death to shock, nervous exhaustion, or prostration from loss of blood, and the concomitant injuries or wounds he has sustained. There is, also, nothing in the post-mortem appearances to indicate that any structural change, beyond the diminished quantity and impoverished quality of the blood, has preceded death; though, no doubt, were we capable of recognizing them, physical changes, commensurate with the exhausted nerve force, would be found. Fortunately this is not a very frequent cause of death in Civil Hospitals, though on the field of battle and in Military Field Hospitals, during action, it is of more frequent occurrence. It happens, however, sufficiently often to have been seen by most Surgeons, and is one of the great sources of anxiety when we are compelled, by the urgency of the cases, to perform capital operations on those who from any cause have been previously much exhausted. I believe that if the records of such cases as have proved fatal after serious wounds or surgical operations, and are recorded under the headings of Shock or Exhaustion, could be thoroughly analysed, and the post mortem examination carefully revised, it would be found that a certain number of them were not due to the immediate effects of shock or nervous exhaustion, but to a pathological condition of quite a different nature, one which has been but little studied as a cause of death after surgical operations and severe injuries.

Pyæmia, shock, gangrene, tetanus, and secondary hæmorrhage are the formidable complications which, even to the layman's mind, render all surgical proceedings replete with dread, and terribly does the first of these interfere with our success. But that a patient may have recovered from the shock and first effects, and subsequently perish from another cause

differing from any of these, and yet directly traceable to the operation, is hardly generally known, and even professionally has received but little consideration. The cases I append, and for the details of which I am indebted to my House Surgeon, Baboo Gopal Chunder Roy, L.M.S., are good examples of what I refer to, and merit consideration.

The chief points of interest for consideration are that, in persons previously in fair health, a condition of the blood may be induced as the result of the effects of a severe injury, wound, or operation which has a tendency to cause the formation of fibrinous coagula in the cavities of the heart, which may, and do, prove fatal. Such being the case, what are the peculiarities in the individual, or his case, that pre-dispose to this fatal alteration in the blood? And what measures can we adopt to prevent, can we in any way predicate the cases in which it may be looked for, and if the symptoms have occurred, can we do anything to arrest, obviate, or lessen the danger?

The condition to which I refer is that of embolism of the right side of the heart, by the formation there of firm, white, fibrinous coagula by which the pulmonary circulation is embarrassed and, finally arrested, when death results from exhaustion and apnœa; that these fibrinous coagula do form in the heart before death, and that they cause death, there can be no doubt. It is well known that in the advanced stages of exhaustive diseases, such as diphtheria, cholera, pyæmia, &c., they do frequently occur and rapidly prove fatal. Here, however, they are regarded as one of the results of the toxæmic condition, and not as the sole cause of death.

But what I wish particularly to point out is that, without the concurrence of any toxæmia, and where in all other respects, saving the effects on the system, of the injury or operation, the patient is considered to have been in fair, if not good health, these fibrinous coagula may form, and slowly but certainly, sometimes suddenly, destroy life, leaving no post-mortem evidence of disease, beyond their presence in the cavities of the heart and pulmonary vessels, with lungs blanched from want of blood, and perhaps shrunken from the gradually diminishing quantity of air supplied to the obstructed pulmonary vessels.

It is to this condition then, as a cause of death independent of other complications, that I refer; and I propose to notice

the symptoms by which it indicates its progress, and the appearances left when it has caused death.

I would repeat that as a condition supervening in the advanced stages of pyæmia, we are familiar with it among Surgical Hospital patients. It frequently indeed in such cases proves rapidly fatal. But that form, uncomplicated with ichorous toxæmia, is fortunately comparatively rare.

In the two following cases there was nothing peculiar in the individuals to suggest the probability of this result. They were, it is true, neither very vigorous nor young persons, but they were quite as young and strong as many who recover without an unfavorable symptom from operations not less severe. The loss of blood, it is to be observed,—and this I think is a point of importance,—was in each case rather more than usual, and was much felt. The operations themselves were also, owing to the hæmorrhage, somewhat unusually protracted.

It will be observed that death did not occur in either case until the 8th or 9th day after the operation, though the symptoms of embolism made their appearance very early.

The symptoms of this form of embolism differ somewhat to that which supervenes in pyæmia or other blood disease.

There is less heat of skin in these cases; the temperature did not at any time arise above 102°. There are wanting all the constitutional symptoms of pyæmia, the rigors, sweats, and peculiar tinge of the skin, with the changes in the urine, and excretions from the lungs and skin. But there is sometimes a peculiar appearance of hebitude or fatuity on the countenance, with incoherence, and even delirium with great restlessness. A feeble and irregular pulse, excited though feeble action of the heart, dyspnœa and hurried respiration; all tell of the struggle nature is making against an enemy that is rapidly sapping and taking possession of the very citadel of life itself. After death, the post-mortem appearances reveal the emboli firmly impacted in auricle, ventricle, and pulmonary vessels, like the branches of a tree, entangled in the cords or moulded in the valves, leaving it a mystery how the circulation was carried on thus far. That such changes should take place in cases of blood disease, where from hyperinosis, lowered vitality, or other causes, a preternatural tendency to clot exists, and where the natural nutritive relation between the tissues, the blood and the innervation must be disturbed, does not, though it may be unexplained, seem strange, and the fibrinous coagula

which intervene and carry off the patient, are regarded as one of the events to be expected in the course of the disease. But when, as I have before said,, a person previously healthy so suffers after a surgical operation or severe injury, we cannot avoid the conclusion that the shock of the operation, the relative or absolute loss of blood, and other changes which consequently occur in the tissues, must have much to say in bringing about this dangerous disease. It is also highly suggestive of the necessity for ascertaining the state of our patients' health, and their freedom from the complications of visceral disease, before we submit them to the chances of this danger. I am now alluding to that form of embolism in which the right side of the heart is affected ; with that of the left, and the arterial system, I am not at present concerned, though this is a subject equally worthy of attention, and may form the subject of a future communication. Embolism, as it happens in the right side of the heart, may occur partially, to a slight extent, and be recovered from. It may be more extensive, and slowly but surely destroy life ; it may be sudden and complete, and may prove fatal suddenly, by withdrawal of blood from the pulmonic circulation, syncope or cardiac apnœa carrying the patient rapidly off. It is rather to the second class of cases I refer in this paper, as they are illustrated by the two cases, but each is of the greatest interest.

In cases such as those now recorded, death is, I fear, generally the result. In the minor cases, death may also occur at a later period, when the coagulum has been disintegrated and washed away as debris, which, as smaller emboli, finally obstruct the capillary pulmonary circulation, and cause local deaths, suppurations, œdema, or hæmorrhage of the lung. Such indeed are the frequent results of this form of embolism as it occurs in pyæmia. I intentionally, in the present paper, avoid any allusion to embolism or thrombosis in other parts of the venous or arterial system, though there is much of interest to be said on that subject, and the history of puerperal patients especially furnish many facts not less interesting than important. The sudden deaths from causes apparently altogether inexplicable, the phlegmasiæ, cellulitis, abscesses, phlebitis, partial or entire paralysis, aphasia, and other forms of disease which we so frequently meet with, or hear of, will, in many instances, receive their best solution by the study of embolism in one or other of its venous or arterial forms.

The earliest symptoms of clotting in the heart should be sought for in all cases of operations on persons who are debilitated at the time ; and such remedies as the pathological condition suggests, should at once be administered ; though, I fear, but with little prospect of success. Stimulants and such agents as may be, however slightly, expected to aid in producing solution of the coagula, or in resisting their further increase, should be freely and frequently given, the strength being supported by the most nutrient diet, and the hygienic conditions of the patient being made as favorable as possible—brandy, ammonia, ether, eggs, and animal broths, with counter-irritation over the heart and a current of galvanism to increase its failing action ; for, no doubt, its diminished movements, with cavities imperfectly emptied of blood, and but partially contracting at each hurried systole, together with a preternatural tendency of the blood to clot, have much to say to the commencement and subsequent growth of the coagula.

According to Dr. Richardson, all the alkalis have this solvent effect to some extent, and he especially recommends the carbonate of ammonia in frequent and full doses, for its double properties as a powerful stimulant of the heart and muscular systems, and a solvent of fibrine. This is a very admirable theory, but it requires confirmation. In those cases where the dangers of complete obstruction of the pulmonary circulation have passed over, and there is yet the debris of the disintegrating coagula to be disposed of, there is still danger of capillary embolism, and the train of dangers it involves, to be provided against. The use of the same class of remedies is again indicated ; quinine, iron, and other tonic and invigorating drugs, with such local and constitutional measures as may tend to obviate the evil results, must be freely resorted to.

For the present, as I have before said, I have confined my remarks to the dangers of complete embolism of the right side of the heart in persons who have undergone severe operations or sustained serious injuries, and in whom the tendency to this destructive formation of fibrinous coagula owes it origin apparently to the operation as the prime cause.

CASE I.

Gooray Shaik, aged 50 years, a Mahomedan husbandman, was admitted into the Medical College Hospital, under Dr. Fayrer, on the 26th January, 1866, with elephantiasis of the scrotum, said to have been of 25 years' growth.

Stated that it had been growing rapidly for the last five years, but the fever which occurred formerly once in a month, ceased to recur three or four years ago. The fever was not in this case synchronous with the lunar changes, but with each accession the scrotum inflamed. It was much hypertrophied, and was nodular on the surface, the right side being larger than the left. The penis was embedded in the mass of the tumour. The patient was an elderly looking man, and said that his general health was otherwise good.

He was kept under observation till the 1st February, when, nothing contra-indicating, the operation for the removal of the tumour was undertaken. It was performed by Dr. Fayrer, and was completed within two or three minutes, but the patient lost a good deal of blood during the ligature of the vessels, some of which bled freely. The tumour weighed 4 lbs. About 16 vessels were ligatured. There was no hydrocele on either side.

Ordered.—Tinct: opii ℥ss., brandy 2 oz., and beaf-tea Oj. to be given during the day. Milk and sago diet.

5 p.m.—There was much bleeding from the wounded vessels; secured by ten more ligatures; pulse weak. Repeat brandy and beef-tea.

2nd.—Pulse 128, very weak; tongue dry; vomited three or four times; no more bleeding.

Ordered.—Brandy 6 oz., beef-tea Oj. to be given during the day constantly.

3rd.—Pulse barely perceptible; is very low; tongue dry; extremities cold.

Ordered.—Brandy ℥ss., ammon: sesq: carb: gr. v., beef-tea ℥j. every hour. Milk and sago diet.

4th.—Pulse distinct, 128, but very weak yet; respiration 29; skin of natural temperature; tongue moist; took very little food. Continue medicine and diet.

5th.—Is rather apathetic; pulse same as before; wound looking healthy. Continue.

6th.—Pulse 128; respiration 32; no cough; respiration natural; heart's action weak and irregular; no murmur with the heart sounds; pulse more distinct, but soft and intermittent; appetite bad. Continue medicine; mustard plaster over heart.

7th.—Pulse barely perceptible; is very restless; occasional hiccup; tongue smooth, and inclined to be dry. Continue medicine every half-hour.

8th.—Same as before; complaining of a pain on the right hypochondrium. Continue.

9th.—Died at 4 p.m.

On post-mortem examination there were found whitish decolourized clots in the right auricle and right ventricle of heart, extending into the pulmonary artery, and into all its minute ramifications within the lung. These, when removed and spread out, had a beautiful arborescent appearance; the pulmonary veins were also plugged with similar clots, which extended into their branches and filled the left auricle; other organs healthy. There was no disease of the viscera; nothing to indicate the effects of pyæmia.

CASE II.

Janoo, a Hindoo, aged 45 years (looking more than 50), was admitted into Dr. Fayrer's ward of the Medical College Hospital, on the 24th August, 1866, with a scrotal tumour of two years' duration. It commenced with an attack of fever, when the scrotum inflamed. The fever subsided and the pain in the scrotum passed off, but the swelling remained. Thus with each accession of fever the bulk of the scrotum had increased to the size of an adult head, when he came for relief. Had been having fever twice in a month, which occurred generally, he said, about the period of lunar changes.

The patient was an elderly nervous-looking man, fidgetty and restless in manner. General health pretty good. Urine was examined; reaction neutral; sp. gr. 1007; no albumen; no sugar.

Whilst under observation he became impatient to be operated on. The tumour was removed, with Dr. Fayrer's permission, on the 3rd September by the House Surgeon, Baboo Gopaul Chunder Roy. It weighed 3lbs. 1 oz., besides the hydrocele fluid on the left side amounted to about 10 ozs; 25 ligatures were applied; lost much blood; spermatic cords elongated; testicles healthy; pulse was weak during and after the operation, and he took chloroform so unsatisfactorily that it had to be intermitted once or twice on account of unfavourable symptoms.

Ordered.—Tr: opii ℥ss. *star:* brandy 4 oz., beef-tea Oij. during the day.

6 p. m.—Slight bleeding from the wound, arrested by the application of three ligatures. Pulse of pretty fair strength; no fever. Took his food.

4th.—Pulse 104 in the morning, and 136 in the evening, small and weak; tongue dry; no more bleeding. Brandy and beef-tea. Continue milk and sago.

5th.— Pulse 120 in the evening; temp. 101°; tongue pale and moist; occasionally delirious; nervous and incoherent in manners; no sloughing of the wound; no stool.

Ordered.—Ammon: sesq: carb: grs. x., brandy ℥ijs., beef-tea ℥ij. every two hours; cathartic enema; sinapism over the heart.

6th.—Frequent attempts to get out of bed; limbs shaky; talks incoherently; no stool; pulse weak as before. Continue medicine and diet.

7th.—Wandering continuing; not boisterous, except at the time of dressing, when he shouts loudly, tries to bite the dressers, and obstinately resists dressing; wound looking pale; pulse weak, 120; temp. 102°; two stools; takes food badly. Continue.

8th.—Pulse 132; temp. 102° at evening; saccharine odour from the body; tongue dryish and furred; delirious occasionally. Continue medicine every 2 hours.

Ordered.—Brandy ℥j; æpt: ether sulph: ℥jj; beef-tea ℥ss. Enema every 6 hours. Mustard plaster over the heart, and galvanism frequently.

9th.—Pulse 128; temp. 102°; respiration 38, same as before; no cough, no tenderness over the liver; heart sounds weak; air entering freely into the lungs. Continue.

10th.—Pulse barely perceptible; was very noisy in the night; respiration hurried; speaks with difficulty.

Died at 11 a.m.

Autopsy.

A firm, yellow, decolorized clot in the upper vena cava extending into the right auricle, which was pretty nearly filled with it. The clot extended into the right ventricle through the tricuspid valve, and thence into the pulmonary artery and all its branches.

The pulmonary veins were filled with similar clots, which passed also into their ramifications and filled up the left auricle; Left ventricle empty. There was a clot in the aorta, which was adherent to the sigmoid valves and ended in a free extremity beyond the origin of left subclavian artery, where it was floating loose within the calibre of the vessel. The lungs were blanched and seemed rather shrunken; other organs healthy, except the kidneys, which were pale and flabby.

FATAL CASE OF IDIOPATHIC TETANUS IN A EUROPEAN.

By J. Fayrer, M.D., C.S.I.

On the 27th of March, 1870, I was requested to see Mr. D—— S——, a Greek gentleman, aged 36 years, of stout frame, lymphatic temperament, though with dark hair and anæmic complexion. He had returned to India about fifteen months ago, after a visit of three years to Europe, having previously resided for six years in Calcutta, during which time his health had been moderately good. During his last visit to Europe he suffered from some severe abdominal disorder, probably enteritis, but he had regained his health when he returned to Calcutta. I found him suffering from a slight feverish attack, for which I ordered a simple diaphoretic, and enjoined quiet and rest at home for the day. He complained also of a pain in the right pectoral region, which was apparently muscular, as the stethoscope did not indicate any thoracic mischief. For this I recommended a sinapism and some simple embrocation.

The weather had during the previous day or two become very hot, and a dry south-westerly wind was blowing.

On the 28th, he was better, but not well enough to go to his office; he was advised to remain at home. I observed that his room was very close and warm, as the windows had all been kept carefully closed; and recommended more ventilation. He said that the pain in the chest was almost gone. I again made a most careful examination, and could detect no sign of either hepatic or pulmonic disorder. I recommended a better diet and some wine.

On the 29th, when I went to see him, his servants said he was better, and had gone to his office.

On the 30th, he called on me at about 11 a.m., and said he was not feeling well; he had a sensation of stiffness in his neck, which he attributed to a chill, the result of going out into the open air from his warm room, when he was perspiring freely; otherwise he was better, had no fever, and his bowels were open, but he had had a restless night, and he looked anxious and uneasy. I ordered an anodyne liniment, and recommended him to avoid exposure to currents of air.

In the evening I received a note saying that he was not better, and requesting me to go and see him. I did so, and found him alarmed and anxious about his condition. He was restless and uneasy, complaining of stiffness in the neck and jaws, and difficulty of swallowing, but, withal, no pain. He looked dark under the eyes; his skin was moist, with cold sweat;

and his pulse about 90°. He could open his mouth, but imperfectly, and there seemed to be general rigidity of all the muscles of mastication and deglutition. I ordered hot fomentations, an anodyne embrocation, and sedatives. I saw him again at 7-30 p.m. and remained some time watching him anxiously. I prescribed Cannabis indica and chloroform internally, with hot stupes to the neck and jaws, which gave some relief. He was thirsty, and drank iced-water pretty freely, but with some spasm; he tried to take soup but very little was swallowed. The rigidity of the neck and occasional spasms of the masseters was increasing; the head was drawn backwards and carried in a peculiarly stiff and erect position. My suspicions were now confirmed, and as I could find no history of any traumatic origin, it was evident that idiopathic tetanus was rapidly setting in. I expressed my fears for the result to his friend, and suggested further advice. Meanwhile, the fomentations and medicines were continued, and beef-tea administered frequently. The attempt to swallow it was always attended by spasm. The effort to expectorate viscid mucus had the same effect.

Drs. C. Palmer and Partridge saw him, and it was decided that the medicines should be continued. Belladonna liniment applied to the neck, and nourishment given frequently. The bowels to be again acted on by enemata, and if the difficulty of swallowing became greater, the medicines to be given by enema.

Nutrient enemata were also ordered, and the administration of chloroform at intervals prescribed. Notwithstanding treatment, the tetanic spasms rapidly increased with renewed intensity. He was much exhausted after each, and his body bathed with cold sweat. The countenance became livid and distorted, as the respiratory and laryngeal muscles were involved, and during the paroxysms opisthotonos was severe. The pulse became rapid and feeble, at times very irregular and intermittent, pausing for a time, as though the heart itself shared in the general muscular spasm. His consciousness remained, he occasionally tried to speak, and asked the nurse to open a window. The least touch brought on the spasm, which rapidly involved the abdominal and thoracic muscles, and left him quite exhausted. The last and fatal paroxysm occurred at about 11-30, and at ½ to 12 he died, completely exhausted by its violence. The pulse had ceased, it returned again for a moment, and then ceased altogether.

Idiopathic tetanus in the adult European is a rare form of the disease, and comparatively seldom witnessed. This was one of the most severe and rapid cases I have seen. The only cause that could be assigned was the sudden exposure to a relatively cold atmosphere, when the body was relaxed by the heat of a warm room, and when the constitution was somewhat depressed after a slight febrile attack. The atmospheric influence at the time was no doubt evil, and

favorable to the development and rapid course of acute disease. The setting in of the extreme heat is always most trying to the European constitution, and at such times disease has a tendency to be rapid as well as acute. Idiopathic tetanus is not uncommon among the natives of India. I have observed that it has a greater tendency to occur at the changes of the seasons, when there are great and sudden alternations in temperature. It is not, as a general rule, so fatal as the traumatic form of the disease, and recoveries are not uncommon; although, as in the present case, it is frequently very severe and rapidly fatal.

A CASE OF APHASIA.

By J. Fayrer, M.D., C.S.I.

The following notes were taken at the time of a very interesting case of aphasia that recently came under my care. The patient was an English officer, holding an important post; he was about 52 years of age, and of about 30 years' Indian service. During late years he had suffered much from chronic diarrhœa and anæmia; a recent visit to Europe had, however, somewhat re-invigorated him. He was of spare, but active figure, and of regular and temperate habits; very intellectual, and much given to study. The duties of his office were of an important and responsible nature, and just before the illness, for which he came under my care, they had been unusually onerous. He had, moreover, suffered much anxiety of mind and domestic affliction, from the illness and death of a very near relative. He had lived alone, and had almost entirely secluded himself from society since his return from Europe some months previously; but lately, his friends had induced him to go out a little, and he had apparently enjoyed the relaxation and change.

It was on June the 8th, (the weather being intensely hot), that I was called in, in passing his house; "he had just had a fit."

His servants, and one or two of his friends who saw him the day before, say he had been perfectly well up to 7-30 or 8 that morning. He had written a note early that morning just before he was taken ill, which was quite correctly worded—a note written to me I imagine, just when he felt the attack coming on, (and of which I append a copy); No. 1 was not so correct.

His servants say that he was lying on his couch, when they suddenly saw that he was convulsed in the right side, and that, on going up to him, he was quite unconscious. It was 10-15 a.m. when I saw him; he was lying on his couch with his eyes closed, but opened them directly I spoke, and appeared to recognize me; he then began to talk incoherently. He appeared not only to be unable to collect his ideas, but also to have lost the memory of words; he kept repeating one, which resembled "played." This came in as the second or third word of every sentence he tried to give utterance to, and he spoke very fast. For example, after replying to my question, how are you? he said, "I am better, I have played," (then incoherence)—"I don't know what brought this on,—" I have paid, played, played," and then again he became altogether incoherent. His pulse was 120, and the radial arteries felt rigid. The

cardiac sounds were natural, perhaps rather weak. I had repeatedly examined his chest before the attack, and the urine had also been frequently analysed, and nothing abnormal detected. Having lost a near relative from Bright's disease, he had been curious on this subject, and was constantly directing his attention to the state of his kidneys. The head was cool; the face pallid; no paralysis; no alteration in the tone of his voice; articulation was perfect; his tongue was clean; his bowels had acted freely that morning. His servants say, they thought him very well when he got up, and they were surprized to see the convulsions. They say, he was not hot at the time, and they noticed particularly, that it was the *right* side that was convulsed. Ice had been applied to his head before I arrived. The urine was examined, and found to be free from albumen. It was acid in reaction, and of normal sp. gr.

It occurred to me that the great heat of the weather—thermometer over 90°—had something to say to the attack, which probably indicated degenerate cerebral vessels, perhaps an embolism in one of them; or that there had been some slight hæmorrhage, or congestion, or transient interference with the cerebral circulation, and probably great general exhaustion of the nerve centres.

I ordered chloric ether and acetate of ammonia, and enjoined perfect rest and quiet; ice to be applied to the head if it became hot, beef-tea to be given occasionally, and the bowels to be acted on by a simple enema. I saw him again at 4-30 p.m., and he looked pretty well; he replied in a word or two to every question, but immediately lapsed into a state of incoherence: he did not recur to the same word that haunted him in the morning, but he substituted his words, and seemed totally unable to grasp the one he wanted. He evidently understood all that was said to him, and tried to answer. A friend asked him to go and stay at his house: he thanked him, and was able to say he preferred remaining where he was; but he was quite unable to continue the conversation, and became incoherent. I left instructions that he should be well watched, and that beef-tea and the medicine should be given regularly.

June 9th.—He is in much the same state: pulse about 120; temperature of body somewhat high. He replies to a first question intelligently, but soon lapses into incoherence. I asked him to read; he took the book and pretended to do so, but it was the most incoherent jargon; all the time he looked quite intelligent. He has taken some nourishment, and is said to have slept. But for his shaven head, he looked fairly well. Cold had been applied to the head, and his bowels had been relieved. He was attended by a careful sick-nurse. In the evening I found him much the same; no improvement in his speech. Dr. C.—— had seen him with me in consultation at 1 p.m.

June 11th.—He remains much in the same condition: pulse from 110 to 120; skin cool, perhaps slightly feverish at times; the bowels act regularly. Takes readily all fluid food that is offered, and sleeps well. He is very quiet, tractable, and gentle; does or attempts all that he is asked to do. He walks with a peculiar gait, the body being bent forward: this is merely an exaggeration of his ordinary carriage. His tongue is slightly coated with whitish fur, and there is a peculiar and somewhat offensive odour in his breath. A small blister had been applied to the nape of the neck, which has risen well, but he does not complain of it in the least. He seems quite tranquil, and even happy; appears to recognize his friends, but he cannot tell, or rather, perhaps, he cannot remember, their names, or the words he wishes to say to them. Yesterday I asked him to name one of his friends who came into the room; he smiled and said,—"Oh that's go-up," and then he muttered some unintelligible words. He can reply to a first simple question, such as,—"have you slept or eaten well?" He answers "oh yes, or no," as the case may be; but the next question, however simple, puzzles him completely, and the reply, for he tries to answer, is the most incoherent nonsense—words without connection or meaning. I asked him to read yesterday, and gave him a book; he looked for his spectacles, put them on, then looked long and earnestly at the book, muttered a few words, and put it down. I then asked him to write a note; he sat down at his writing table to do so, put on his spectacles, took pen and ink, adjusted the paper and sat looking at it. Then, after about a quarter of an hour, repeatedly making efforts to begin, and saying,—"I can't write, oh that's just it!" he scrawled three figures of 8. To-day, the 11th, he read a few words correctly, and then became incoherent. He sat down to write at my request, and after about 20 minutes' delay, he produced the note No. 2, and then seemed so exhausted, that he was glad to go and lie down. It is difficult to say how far he knows what he is doing. In the midst of the simplest reply to a question, he puts his hand to his forehead, appearing to try in vain to recall the word or idea he wants. For example,—have you done so and so?" "Oh yes!" "Do you like it?" "Oh yes!" "Why?" "Because I—I—I can't work a bit, because it's a tight height." I have directed that he shall be very closely watched day and night, but he is tractable and gentle in the extreme. Nourishment with a little wine to be given frequently; an aperient when the bowels are confined; perfect quiet; the head to be kept cool; the feet warm, they are sometimes cold.

June 12th.—He seems rather better to-day: pulse 84; skin moist; head cool; bowels freely opened. I tried him with reading and writing; he read a few words correctly, but others he changed altogether. His writing is appended in Nos. 3, 4, 5. He

answers questions pretty well, and looks as if he understands what he wants to say, though he is unable to remember the words he requires. He saw me looking at some numbers of "Good Words" lying on the table, and said there was something in them that was very good, but he could not remember what it was, or who wrote it; but he took one of the numbers up, and opening it at Gladstone's article on "Ecce Homo," then said, "take it with you." All this was said as by one in perfect health, but he lapsed immediately into incoherence. He has eaten and slept well; is in good spirits, and answers cheerfully to any question. The same treatment continued.

June 13th.—He looks better; is sitting up; slept well; and is taking food freely. Had a pint bottle of claret, and a glass or two of sherry yesterday. I asked him if he had read the newspaper, and he replied, "Oh yes; Eyre! Eyre, Chief Justice." He then took up the *Englishman* and read that "the Chief Justice, and all the *Iudges* (judges) had done so and so;" he made one or two mistakes, but on the whole had more command of words than he had yesterday. He remembered my name, and mentioned it several times, but he could not manage that of an intimate friend who had just then come in to see him. I asked him to write a note, and he at once cheerfully sat down to do so. The result is appended. (No. 6.) There is also a memo. of what he wished to have for tiffin (No. 7), and dinner, and an order that was to be sent to his wine merchant. (No. 8.) His skin and head were cool; pulse 84; bowels open; much less of the peculiar odour first noticed in his breath. Altogether, he looks much better and stronger; is cheerful; and walks with a less stooping gait. To-day I ordered a quinine mixture with tinct. nucis vomicæ.

The blister on the neck is still open. He takes a generous diet, and one pint of claret daily. On the evening of the 18th he was evidently better. He had written an order to his wine merchant, and some other notes. He read several lines with few mistakes; he seems much interested in doing this, but soon gets tired, and then he becomes quite unintelligible.

June 14th.—He is better this morning: pulse 80; has slept well; no heat of head or body; reads very well, miscalling only a few words. Talked quite naturally about many things, and especially about his illness; remembered being taken ill, but could not describe his sensation; remembered people also who came to see him, and the days on which they came, but could not always remember their names; even whilst talking he forgets words, or substitutes others of a similiar sound; at the same time he appears conscious of his defect of memory. He wrote a note (copy appended, No. 9), to a friend; he remembered his name, and appeared much amused that he did so. It had been stormy during the night, and this was evidently in his mind when he wrote; notwithstanding that he spoke so well, the

wording of his written memo. No. 10 shews how far he still was from health. I should note that the handwriting from the beginning has been almost as steady and firm as when in his usual health. Dr. C—— saw him again with me to-day. He read and wrote for us; the reading had few mistakes, those mostly at the end of the sentences; the writing not nearly equal to the reading. He talked quite naturally on many subjects, and his general aspect was that of great improvement.

June 15th.—He seems to be doing well. He read a telegram in the paper, and commented fairly on it, but made several mistakes in his words; read part of a book equally well, and wrote memos. (Nos. 11-12) about his food; his writing falls far short of his reading or conversation. His physical health is good; bowels regular; pulse 80; temperature of body normal; his memory, in some respects, is not so good as it was a day or two ago: he could not to-day remember the names of common objects, such as a bell, a book, (the latter he called "bok"), a paper knife, or his intimate friend's name, but was quite sensible of his defect of memory, and smiled as he alluded to it. He takes his food well, and half a bottle of claret daily.

June 16th.—He is much the same, with memory, if anything, rather clearer. He reads with few mistakes, but his writing (No. 13), was not equal to his reading; he has a fair appetite, slept pretty well last night. It should be noted that during the last ten days rain has fallen, and that the atmosphere has been much cooler, which has been in his favor.

17th.—He is improving; had a good night; tongue clean; pulse 80; blister healed. He read an advertisement in the newspaper quite correctly, and spoke well, with occasional mistakes, of which he was quite conscious. I have cautioned his friends and the nurse against allowing him to sign or write cheques or letters.

18th.—He continues to improve and reads and writes (No. 14), better, forgetting fewer words. His physicial health is otherwise good.

19th.—He continues to improve; conversation perfectly natural; reading almost without a mistake; writing (Nos. 15-16), improved, but still not correct. An ordinary observer would now probably not notice any peculiarity in his conversation.

June 21st.—Doing well; speaks almost quite correctly. In reading he occasionally mispronounces a word, but seems aware that he has done so.

June 22nd.—He is doing well; speaks and reads correctly, or nearly so; writing (No. 17-18), improved, but still not perfect. Does not seem to be in quite such good spirits as he has been.

June 27th.—He is quite convalescent; has been out driving. His conversation and reading are now nearly perfect. He occasionally forgets or substitutes one word for another. He has a tolerably distinct recollection of all that has happened, and

remembers being taken ill, but has no recollection of the fit. He is to leave India for Europe by an early steamer.

July 3rd.—He has left by the steamer, in all respects much better, but still he occasionally forgets a word.

He arrived at home safely, and for some time was much better for the change. Subsequently I heard, but without details, that he had some recurrence of the symptoms; the results of this attack I have not heard, but I believe he is at present (September, 1869), alive and well.

The following are specimens of his notes and memoranda written at my request during his illness. The writing generally was as good and firm as though he had been quite well. There are peculiarities which cannot be represented in print; often the initial letter of a word is obliterated and re-written, as though he had hesitated as to what letter he should use, and many marks and letters that are of necessity unintelligible, are left out, as they could not be imitated.

A gradual improvement in each note may be observed, but the composition was always inferior to his manner of expressing himself; and when he wrote the last of these notes, his conversation was almost without a mistake; most of these memoranda were signed in his usual bold and firm hand-writing; his signature, indeed, alone would not have betrayed any defect. But the notes themselves shew that, as Dr. Bastian would say, the condition of agraphia continued after that of aphasia had well nigh passed away.

No. 1. June 8th.
Please come wall and see me. Y.
8th August.

No. 2. June 11th, 1868.
I am so bad to-day, abad, all abad. Yesterday all ab—abeledu—all bide—blessed, blesse tut.
Js. Js. Js.
P. P. P. P. P.
Bless, bless.
Bless: 11, bless 11, blesse.
P. B. B. B.
P. P.

No. 3. June 12th, 8 a.m.
Wednesday.
I should nisbly a wark of blacking a book of book if I ask.

No. 4. June 12th, 4 p.m.
Have any one a dundred any brere wone.
By belief was very ill. A dwelling; so dcrely a darèf; a waif all along light. At about a enayty brefest a baturfent about after a dayfeet about first day.

No. 5. 12th June also.
I am better, he is better, but ill a ill my bill a better ill i bill my better is a boulier ill I———

No. 6. June 13th.
It was bloying all the well, it was barring in bottle, it was sainty. It has been raining all the night; I have been very.

No. 7. June 13th.
Bacon. Begs. Begels. Spiripe Scink. Soups. Spitch Cock. Spineiple.
This was what he wanted for tiffin.

No. 8. June 13th.
Beshonath Law.
Claret wine as usual. Some for my tervan.

No. 9. June 14th.
You we have had an awnully lot of both, during last night it was training during last night, the train was for-fully getting it.

No. 10. June 14th.
Swit Bread. Dinner. Soup. Spick lock. Brodline.

No. 11. June 14th.
I heems to have been pretty well and am as just as you are all. I am better than I was, but I hope in a few days I shall be able to do so as I well can.

No. 12. June 15th.
Something about two o'clock a bed of mutton to read. Then at night, I will have something to read at nice I will have some wine for me.

No. 13. June 16th.
It has been wet than it used to be. There is very little to be done for all the Englishmen to be said.

No. 14. June 18th.
I have been seeding the paper, and have been reading about all the news.
Kidneys for breakfast.
Spitch Cock. Soup. Roast mutton.
Wine. Bordeaux.

No. 15. June 19th.
Morning. Eggs and Bacon.
Tiffin. Mutton chop. Soup. Mutton or Beef.
Bordeaux.

No. 16. June 20th.
We have ordered fish and omelet.
There is nothing ordered for tiffin, as nothing is yet settleded.
Soup. Beef or Button.

No. 17. June 21st.
I am very much better than I have been for the last few times. I have ordered some breakfast, but nothing yet for tiffin and dinner.
No. 18. June 22nd.
I am quite well, and I have nothing to bother me about my head at all. I have not heard what we are to have in tiffin or T. Tinner. The T breakfast we are to have fish and omelet.

I have recorded this case in detail, as it illustrates some points in the pathology of the disease that have been much discussed by recent observers. The symptoms were exactly those described by Trousseau and others; the loss of memory of words, even whilst the intelligence was comparatively good, was remarkably shewn during his recovery. The incapacity to write correctly whilst he was able to express himself almost clearly, was very illustrative of that phase of cerebral disease which has been termed "agraphia" by Dr. Bastian.

The convulsion on the right side, at the commencement of the disease, so far supports the views of Dr. M. Dax and others who localize the cause of the disease in the left cerebral hemisphere. Happily, the opportunity did not occur of ascertaining whether in this case the views subsequently promulgated by Drs. G. Dax and Broca, as to the precise localization of the lesion in the anterior and outer portion of the middle lobe of that hemisphere, near the island of Reil, and consequently close to the posterior portion of the frontal lobe, were correct. His recovery without paralysis, and the almost perfect restoration of the power of speech and writing seems, I think, to point to disturbance rather than functional structural change. Though the prematurely aged appearance, the rigid arteries, and other general indications of adipose and atheromatous degeneration, suggest the possibility of disturbed cerebral circulation, and point, perhaps, to the middle cerebral artery as the seat of some transient interruption of circulation, or the temporary presence of a thrombus or embolom, whose origin is traceable to degenerate vessels. It is possible that congestion, or slight hæmorrhage, may have occurred from similar causes; and as the central ganglia were probably only slightly compressed. The symptoms, after the convulsion had passed, were confined to what was due to changes of a transient nature that had occurred in the left anterior central lobe.

It is possible that this may have been one of the protean forms assumed by cerebral exhaustion, the result of long residence in a tropical climate, exhaustive disease, and an overwrought brain; and that structural disease, in the conventional acceptation of the term, may have been absent, the pathological explanation being sought for rather in dynamical than material changes. In any case, it is impossible not to regard the future

ON THE BAEL FRUIT AND ITS MEDICINAL PROPERTIES AND USES.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

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BY

SIR JOSEPH FAYRER, K.C.S.I., M.D., F.R.S.

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79 deaths; in the latter to 410, with 266 deaths.

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ON THE

BAEL FRUIT AND ITS MEDICINAL PROPERTIES AND USES.

GENTLEMEN,—I have recently, through the kindness of a friend, received from Calcutta some very fine specimens of the Indian bael fruit. They have arrived in perfect order, and as the opportunity seems a good one, I desire to take advantage of it by directing your attention to a remedy of considerable repute in India in the treatment of some forms of bowel complaint; and one also that I think might often be of use here in similar cases, especially in those forms of chronic diarrhœa and dysentery that are seen in persons who return to Europe after residence in India or other tropical climates.

The Bael is already well known to many in England, and is included in the list of drugs in the "British Pharmacopœia," where it appears in the form of the dried fruit,* and the liquid extract, which is "prepared from the half-ripe fruit of Ægle marmelos, brought from Malabar and Coromandel"

* The specimen on the table is prepared by Mr. Squire.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

—known in fragments of a brownish-orange-coloured dried pulp adhering to the rind of the fruit. It has been, says Mr. Squire in his valuable commentary on the Pharmacopœia, "extolled in the treatment of diarrhœa and dysentery, and is given alone or in combination with other astringents, such as the red gum of the Eucalyptus rostrata."

This liquid extract of bael is prepared by macerating the dried fruit in water and rectified spirit. The fluid is to be evaporated, pressed, and filtered; an intensely brown fluid is the result, of which ʒj. to ʒij. may be given as a dose. This and the dried fruit are the only officinal forms in which it is known (so far as I am aware) in this country; and though I do not wish to disparage them, for I really know little of their properties in this state, yet I imagine they have neither deserved nor acquired much repute as medicines. I think the case is different in regard to the fresh fruit and its preparations, and it is to them, therefore, that I wish to call your attention, for it is quite possible now, in these days of rapid communication, to procure constant supplies direct from India; and even though it should not maintain its value here as it does in the East, yet, as some of you will probably serve in India, it is well that you should be acquainted with a remedy that often proves valuable there. Do not suppose that I wish you to think of the bael fruit as an unfailing or actively specific remedy in acute disease; it is nothing of the kind, but simply one that is occasionally very useful in some forms of chronic disease, and successful where other remedies fail. It has the advantage, moreover, of being simple, common, and easily procured. Now, I am a great advocate for utilising the local remedies of the countries in which one may live, and would recommend you

to make yourselves acquainted with them as much as possible, not merely as a matter of economy, but because it renders you more independent of costly European drugs, and because it is right to develope and encourage the use of such as are really reliable and effective; and I can tell you that there are many native remedies that might with advantage be introduced into European practice. This is a consideration that I would urge on those especially who are likely to exercise their profession abroad; and it is one that I have recently pressed on Government, with the effect, I trust, of providing for the more general use of native indigenous remedies, and for the extended use of such European drugs as are found to be capable of cultivation or preparation in India.

The particular example to which I now invite your attention is the fruit of an aurantiaceous tree, known to botanists as the Ægle marmelos. It is common nearly all over India, and everywhere is held in much esteem, and indeed veneration. By the Hindoos it is regarded as a sacred tree, its ternate leaf being considered as a type of the Hindoo trinity, or of Sivà, a member of the sacred triad. It is, moreover, thought to be pervaded by the presence of Durga, or Kali, the wife of Sivà, and hence has a double odour of sanctity, and is much grown around pagodas and temples. It is valued not only on this account, but because its fruit, leaves, bark, and wood are all considered to be endowed either with medicinal properties, or to be of value in other ways. I propose to consider only the medicinal properties and uses of the fruit.

Descriptions of the tree may be found in most works on the trees and plants of India. Dr. Cleghorn—a high authority on all that regards Indian forest and plant life—has given

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In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

an account of it in the *Indian Annals of Medical Science*, and he tells us that it has many synonyms, of which the following are some:—Ægle Marmelos (Wight and Arnott), Feronea Pellucida (Roth), Crateva Marmelos (Linn), Belva Bilva, Maridu (Sir W. Jones in "Asiatic Researches"), Cov-alum (Rheede Hort. Malabar), Bael, Bil, or Bela (Hindi Bengali), Beli (Cingalese), Naraidu (Telinga), Tanghala (Malay), Willamaram (Tamul), Bengal Quince, Stone Apple (English).

In Bengal and Northern India, where I have known it, it is commonly called Baol or Bel.

The tree is moderately large—twenty, thirty, to forty feet high; the branches are irregular and not numerous. The leaves are ternate, and dotted like those of other orange trees; flowers are whitish and sweet-scented. It has sharp strong axillary thorns, which are more numerous in the wild, uncared-for, stunted trees growing on poor ground than in the cultivated trees, on which also the fruit are much larger and more highly flavoured than on the former. The fruit is, as you see, a large globose or obovate hesperidium or orange, of various sizes, from a small orange to that of the individual before you, with a hard, woody rind, with a fragrant aromatic epidermis. The interior is a yellowish aromatic and astringent pulp, with a pleasant and peculiar flavour. It contains ten to sixteen cells, each lodging a tomentose seed, embedded in a tenacious viscid transparent mucus, which has a peculiar, somewhat terebinthinate flavour. The rind is pungent and aromatic, with essential oil. As I have already remarked, the tree is sacred to Śivà, and the worship of this god, under the name of Mahadeo, is prevalent everywhere throughout India. "The daily ceremonials are of a severely austere and simple character,"

says Monier Williams; "water from a sacred river is poured over his symbol, with perhaps a few oblations of flowers, but often there is nothing presented by the worshippers but the Bilva, or bael leaf."

The following is the best full description of the tree I can find, by Dr. Brandis, F.R.S., the Director-General of Forests in India:—

"*Ægle Correa*.*—Leaves alternate, trifoliolate; leaflets pellucid, punctate. Flowers bisexual. Calyx small 4, 5, dentate, deciduous. Petals 4, 5, imbricate. Stamens numerous, with short subulate filaments, and long linear anthers. Ovary on cylindrical disc, with a fleshy axis, and 10-20 small cells near the circumference, with numerous ovules in each cell attached to the central angle. Stigma capitate, obtuse, deciduous. Fruit globose, with hard, woody rind, 8-16 celled, filled with an aromatic pulp. Seeds numerous, oblong, flat; testa woolly, covered with a viscid fluid. I. Æ. Marmelos, Correa; Roxb. Cor. Pl. t. 143; Fl. Ind. ii. 579; Wight and A. Prodr. 96; Wight Ic. 16; Bedd. Fl. Sylv. t. 161. The *Bael* tree—Sanscrit *Bilva*, *Mahura*. Vernac., *Bel*, *bil*, *bila*, *bili*. Local name *Mahaka-marra*, Gonds., C. P.; *Ushitbea*, Burm. Glabrous, armed with axillary, straight, strong, sharp spines one inch long or more. Leaflets three, rarely five, ovate-lanceolate, crenate, terminal long-petiolulate, lateral nearly sessile. Flowers greenish-white, with a fine honey scent, on short lateral panicles; pedicles and calyx pubescent. Calyx flat, teeth indistinct. Petals oblong, coriaceous, thickly dotted. Filaments occasionally fascicled. Fruit

* The dried specimen of the plant now before you has been kindly lent me by Sir Joseph Hooker, K.C.S.I., P.R.S., from the Kew Herbarium. The fresh fruit were sent to me by Mr. W. Gibbons, of Calcutta; they came by a Canal steamer, and arrived last March.

79 deaths; in the latter to 4·10, with 208 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

globose, oblong, or pyriform, two to five inches diameter, with a smooth grey or yellow rind, and a thick orange-coloured, sweet aromatic pulp. Wild in Siwalik tract and outer Himalaya, ascending to 4000 feet, from the Jhelum to Assam; also in Oudh, Behar, Bengal, Central and Southern India, and Burmah. Often gregarious when wild. Cultivated throughout India, except in the northern part of the Punjaub; frequently planted near Hindoo temples. Leaves shed about March and April; the new foliage appears in April and May. Flowers about May; and fruit ripens in October, November; remains long on the tree. When cultivated, a middle-sized tree to thirty-five feet high, with a short, erect, often fluted, irregularly-compressed, and scooped-out trunk, attaining a girth of seven feet; branches few, extremities often drooping, forming a narrow oval head. Wild (in North-West India), generally a small scrubby tree. Bark of trunk and larger branches half an inch thick and more, outside soft, corky, light cinereous or bluish-grey, with large dark stains, and irregular, longitudinal, shallow furrows. Wood light-coloured, mottled with darker wavy lines and small light-coloured dots; medullary rays indistinct; even, close-grained, forty to fifty pounds per cubic foot. The tree, being valued for its fruit, is not often felled; but the timber is esteemed for strength and toughness. Used in construction for pestles of oil and sugar-mills, naves and other parts of carts, and for agricultural implements. Twigs and leaves are lopped for cattle-fodder. The tenacious pulp of the fruit is used medicinally in diarrhœa and dysentery, as sherbet, and as a conserve (Pharm. Ind. 46). Dry, it keeps well as a hard, transparent substance. It is also considered as an excellent addition to mortar, especially in building walls. Snuff-boxes are made of the shell of the

fruit; the leaves, root, and bark are used in native medicine; from the flowers a scented water is distilled.

In 1868 a Pharmacopœia for India was published, under the auspices of Government, edited by Dr. John Waring, a distinguished member of the Madras Medical Service. This valuable work is based on the British Pharmacopœia, and, while affording all the information contained in that work of practical use in India, embodies and combines with it such supplementary matter of special value in that country as should adapt it to meet the requirements of the Indian Medical Department. In this work the following description is given of the forms in which Bael is prepared for use:—

1. Bael Mixture (Sherbet): "Two ounces of the pulp, two ounces of white sugar, four ounces of water; mix them thoroughly and add ice; it may be strained through linen, and is an agreeable form in which to take it, and is so taken by many in India when the bowels are deranged; for its beneficial action in giving tone to the intestinal tract. It is generally taken early in the morning, and may be repeated twice or thrice daily to the extent of a large wineglass or small tumbler full." *

Waring says: "It possesses all the aroma of the fruit, and when prepared with ripe fruit is not only astringent when diarrhœa exists, but possesses the singular property of being aperient if the bowels be irregular or costive. When the patient is much reduced in strength, and the stomach is irritable, the above mixture sometimes disagrees. It might then be given in smaller and repeated doses, and if these are rejected the extract *may* be tried."

* Sherbet thus made from the fresh bael fruit—made as it is used in Calcutta—by Mr. Squire, was exhibited to the class.

79 deaths; in the latter 69 416, with 200 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

The Liquid Extract (Ext. Belæ Liquid.): "Take bael fruit 1 lb., water 12 pints, rectified spirit 2 fluid ounces; macerate the bael for twelve hours in one-third of the water, pass off the clear liquor; repeat the maceration a second and third time for one hour in the remaining two-thirds of the water; press and filter the mixed liquors through flannel, evaporate to fourteen fluid ounces, and when cold add the rectified spirit"; dose from one to two drachms. This extract, prepared from the dried bael imported into England, appears to possess much less medicinal power than the extract and mixture prepared from the fresh fruit in India.

This, indeed, is the preparation of the British Pharmacopœia about which I have already expressed doubts as to its activity.

The Extract of Bael (Extract. Belæ), made from fruits that are ripe and have thin shells or rinds: "Extract the pulp, place it in a vessel, add water sufficient to cover it, stir for two hours, and strain through stout calico. Repeat the process until the fluid which passes is tasteless; evaporate over a water-bath to the consistence of a soft extract." This preparation retains all the aroma of the fruit. Dose from half a drachm to one drachm, twice or thrice daily. It is said to keep better if made from the unripe fruit.

There are other forms in which it is administered, and I will mention the most important of them.

Mr. A. Grant, of the Bengal Medical Service, describes several (in a paper in the *Indian Annals*, vol. ii. of 1855) in use in Bengal; for example:—

"The unripe fruit, squeezed and kept exposed to the air for a whole night, is then boiled and strained and sugar added. Of this a wineglassful is taken twice a-day." He

says the bael is known to be carminative in the form of preserve or syrup.

The syrup is prepared thus:—Pulp of bael and sugar, each 2 tolas = ℥xj.; Eusophgool (Plantago Isphagoola) bran, 6 mashas = ℥jss.; rose water or confection of roses, 1 tola = ℥vj.; water a wineglassful; mix; give three or four times a-day.

In dysentery the following formula is used:—Bael mixed with dried shell of Garcinia mangostana, 4 mashas = ℥j.; flour of pomegranate, 4 mashas = ℥j.; syrup of bael, 1 tola = ℥vj.; mix for a dose three times a-day. As to the use of the bael sherbet I have already described, Mr. Grant makes the following remarks, in which I quite concur:—"It is not only astringent, but possesses the property of being aperient if the bowels are irregular or costive; this last quality it seems to derive from being stomachic and promoting assimilation. When the patient is much reduced in strength, and his stomach weak, the sherbet sometimes disagrees; it ought then to be given in smaller doses."

Bael marmalade, according to Mr. Grant, is prepared in the same way as orange marmalade. It is eaten on bread, and is said to keep well.

Dr. J. Jackson gives the following recipe for bael conserve:—Take forty bael fruit, pass the pulp through fine muslin (no water to be added), take six seers (12 lbs.) of fine white sugar, boil it into syrup, then add the bael, and boil them together over a slow fire until the whole is made into a jelly.

"But," says Mr. Grant, "as at times, however, all the above preparations will, either from their bulk or sweetness, disagree with the patient, it becomes an object to obtain the

79 deaths; in the latter to 216, with 205 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

medicine in a more concentrated form, more convenient for prescribing." Accordingly, Mr. Scott, of the Government Dispensary in Calcutta, devised the following formula for an extract, which Mr. Grant says he tried with favourable results. This extract will keep for any time; it retains the aroma and taste of the fruit and its medicinal principles, the starch and other insoluble portions of the fruit only being rejected. Its consistence is uniform, like molasses; its colour dark brown; its smell that of bael. The dose is from ʒss. to ʒj. two or three times in the day, or even oftener. It should be used recent, but he thinks it does not keep so well as stated by Mr. Scott. The extract prepared from the unripe keeps better than that from the ripe fruit. This is the formula:—Take the pulp of the ripe fruit with their shells, put it into a vessel and cover it with water; then churn it as you would churn butter for a couple of hours. Throw this on a calico strainer, and when the whole of the clear solution has passed through, replace the contents of the strainer in the vessel with half the quantity of water, and churn again for a couple of hours; filter as before, and continue to do so until the liquid passes through the filter tasteless. While the process is going on, bruise the shells of six baels and boil them well in two pounds of water, filter the solution through the calico strainer, add to it the filtered solution of the fruit, and having put the mixed solution in an evaporating dish over a water-bath, evaporate them down to the consistence of a good extract. If the medicinal properties of the bael depend on the tannin it contains, this extract, which is made only from the soluble portion of the fruit, must contain it also in all its integrity.

Mr. Scott gave also a formula for concentrated syrup as

follows:—One ounce of the extract dissolved in twenty ounces of water, adding eight or ten ounces of sugar-candy; then evaporate it in a water-bath to the consistence of a syrup. The late Dr. Chuckerbutty, Professor of Materia Medica in the Medical College of Calcutta, recommended a preparation of dried bael to be used when the fresh fruit is not procurable, which is the case for some time each year. The pulp is strained through a coarse sieve, and is then kneaded into cakes and baked, to be eaten like a biscuit. This contains all the astringent properties of the fruit, it is said. This process of preparing the dried bael was devised by Mr. Bowser, the energetic and intelligent Steward of the Calcutta Medical College Hospital.

Other preparations are sometimes made with the bael after it has been partially roasted; and the Hakeems and Kobirajes, I believe, prefer to use it in this form. Dr. Chuckerbutty occasionally recommended the use of the burned bael in the treatment of bowel complaints.

Dr. O'Shaughnessy, in the "Bengal Dispensatory," says:—"The statements we find in works on Oriental materia medica are very various as to the qualities of this tree and its products. Rheede says a decoction of the bark of the root is considered in Malabar to be very useful in hypochondriasis melancholia and palpitation of the heart; and that the leaves are used in decoctions in asthmatic complaints. The same authority says that the unripe fruit is of use in diarrhœa.

"Among the Javanese the fruit is deemed very astringent. Roxburgh correctly states the fruit to be delicious to the taste and very fragrant."

In the "Asiatic Researches," vol. ii., page 349, it is stated that "the fruit is nutritious, warm, and cathartic (a curious

79 deaths; in the latter to 410, with 200 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

combination of qualities), its taste delicious, its fragrance exquisite. Its aperient and detersive qualities, and its efficacy in removing habitual costiveness, have been proved by constant experiments. The mucus of the seeds is for some purposes a very good cement." It is, indeed, remarkable how hard the mucus becomes when dry.

In the *Transactions of the Medical and Physical Society of Bengal*, vol. iv., page 110, Baboo Ram Comul-sen gives an account of the uses of the fruit and various parts of the plant. His botanical description is that given by Dr. Carey, and the following is an extract from the work referred to, giving it in detail:—

"In Bengal the parts of the tree which are employed are the bark, the root and stem, the leaves, and the fruit, both immature and ripe. The bark of the tree is peeled whilst fresh, and a decoction of it is made, in the proportion of two tollas, or about an ounce, to eight chittacks, or about a pint, of water. It is boiled to one-fourth, and administered in bilious fevers.

"The bark of the tree is sometimes used in fever, but rarely alone, being more usually one of those mixtures which are known as combinations of fourteen or eighteen substances, and given in remittents. When used alone, it is given in a similar decoction as the bark of the root.

"The expressed juice of the leaves, diluted sometimes with a little water, is commonly given in colds and incipient fevers, when the patient complains of general dulness, pains in his limbs, and sense of fulness of the stomach. The juice is slightly bitter and pungent, and induces perspiration.

"The young leaves are also used in ophthalmia, and are made warm, and so applied to the eyes, to relieve pain and in-

flammation. The unripe fruit is cut into small slices and dried, and a decoction is formed of the dry pieces by boiling them in the same proportion as the bark. It is in this preparation that the medicinal properties of the plant are most decidedly manifested; and the decoction of the dried unripe fruit is a most valuable remedy in diarrhœa and dysentery. It is particularly serviceable in the bowel complaints of children, but is also of benefit in several stages of such diseases in adults. The other forms in which the fruit is employed belong rather to diet than medicine, but they deserve to be noticed as employed in such disorders. A preserve is likewise prepared from the fruit before it is ripe, by boiling with syrup, which is also given to patients labouring under bowel complaints, with benefit, when every other article of food is the cause of fresh excitement, and attended with a feeling of oppression after being taken into the stomach. The ripe fruit is also beneficial in the same way: a sort of sherbet is prepared from it with tamarind-juice, which has rather an opposite effect, but it is on that account beneficial in fevers and inflammatory affections attended with thirst. The glutinous matter about the seeds is used by planters as a size and varnish. The bael is not the less esteemed by the Hindoo that the tree is held particularly sacred to Mahadeo, and is always worshipped at festivals celebrated in honour of him or his spouse, at the Durga Pooja holidays and similar celebrations."

The medicinal virtues of this plant are probably due to the astringent, aromatic, and demulcent properties of the pulp. It contains a considerable quantity of tannin, essential oil, balsam, and aromatic principle in the pulp, in the rind, and in the tenacious mucus surrounding the seeds. These may be preserved to a certain extent in the dried pre-

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In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

paration, but the fresh fruit is in all respects better and more active, and as it can be so readily imported, there is no reason that I know of why it should not be brought into use. There can be no doubt that the bael is a very ancient remedy among the native physicians of India, albeit Dr. Wise does not refer to it in his "System of Hindu Medicine." It is referred to in the Ayur Veda, the book of Sushruta, a Hindoo System of Medicine, dictated to him by the "holy sage and physician Dhanantwari"—a work still of great authority among Hindoos. It continues to be a favourite remedy among medical men of all denominations in India in the treatment of chronic bowel complaints, and it is not unfrequently given in combination with astringents, such as the kutch or catechu. The specimens before you, which have been in England since March, and are perfectly fresh at the end of May, are remarkably fine ones, and rather larger than those commonly met with (they have been evidently selected) in the Indian bazaars. You will recognise the peculiar fragrant aromatic odour, the yellow colour of the pulp, and the viscid mucus surrounding the seeds, which, Dr. Brandis tells us, is used for various industrial as well as medicinal purposes; a great contrast with the dry form in which the fruit is generally imported, and as you see it here. Mr. Squire has kindly undertaken to reinvestigate the question in its pharmaceutical aspects, and I trust he will succeed in adding some useful preparations of this fruit to our list of remedial agents, and that both in the fresh and preserved conditions it will be brought into use in England.

The bael is not, as you will have gathered from what I have said, confined to the pharmacy of the Hakeems and Kobirajes (*i.e.* the Mohammedan and Hindoo physicians); it is much used by European medical men, and I have given

you most of the formulæ in which it is administered. I will not occupy your time by much further detail on this subject, but may just say that, in addition to the authorities I have already mentioned, others have written on the subject, and if you care to do so you will find descriptions of the plant by Pereira in the *Pharmaceutical Journal*, vol. x., page 165; by Sir R. Martin in the *Lancet* of July, 1853, page 53; by Dr. Horsefield in the *Transactions of the Batavian Physical Society*, vol. viii., page 25, and by various learned authors of the last two centuries, such as Burmann, Bontius, Garcias ab Horto, and Caspar Bauhin. Descriptions of the plant and its uses are also to be found in the works of Roxburgh and Wight, Shortt, Newton, Green, Bose, Bidie, Pogson. In a paper entitled "Remarks on the Indian Bael or Bela in Dysentery, Chronic Diarrhœa, and Dyspeptic Disorders," by J. Adolphus, published in London in 1853; also in "Notes on the Nature and Uses of the Indian Bael," by H. O. Renfry, London; Bibl. Manchester Medical Society, 1855; also "Bael ou Bilva, Fruit de l'Ægle Marmelos," A. Collas, *Revue Coloniale*, August, 1856. Dr. Macnamara, late Professor of Chemistry in the Calcutta Medical College, has also recorded an examination of the fruit, in which he compares the ripe and the unripe fruit, in reference to the proportions of tannin or other astringent principles contained in each, and in which he states that the ripe contains more tannin than the unripe fruit, in the proportion of five to three. It contains more sugar, more of the bitter principle and vegetable acids not tannic. He obtained also, by means of ether, a balsam having a strong odour, closely resembling that of Peruvian balsam. This exists in much larger quantities in the ripe than the unripe fruit. He says the astringent properties are due to tannic acid, and that the

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

ripe fruit, containing more of this than the unripe fruit, is more potent.

Dr. Macnamara suggests that the good effects of the bael may be due to the tannin and the balsam. His remarks on this head are important:—"May not the astringent effects of the bael be due to the tone which it gives to the coats of the intestines, and to its balsam rendering the secretions of the mucous membrane more healthy? It would then decrease the number of stools in a dysenteric patient, or in an otherwise healthy one, but who is liable to mucous diarrhœa; while in a person of constipated habit, given to good feeding, bael might act as a laxative, by keeping the mucous secretions healthy, preserving the tone of the muscular coat, and so enabling the intestines, liable to irritation by peccant matters, to expel the crudities—nay, probably such people would be very liable to diarrhœa if they intermitted the bael; and so, even with them, the bael may really be an astringent."

Sir R. Martin, alluding to the composition of the bael, says in the *Lancet* (in regard to an analysis of the fruit by Mr. Henry Pollock) that "the pulp and the hard shell of the fruit do not appear to differ chemically in any respect except as to quantity. They both contain—(1) tannic acid; (2) a concrete essential oil; (3) a bitter principle which is not precipitated by tribasic acetate of lead, and a vegetable acid. The pulp also contained a considerable quantity of sugar, in which it was preserved. All three of the substances I have mentioned exist in the largest quantities in the rind. There is most acid in the pulp."

Many medical officers in India have used this remedy in their practice, and generally have recommended it. The most elaborate and instructive paper on the subject is that by Mr. A. Grant, in the *Indian Annals*. Dr. Annesley,

Dr. Jackson, Sir R. Martin, Dr. Waring, Dr. Duncan Stewart, Dr. E. Goodeve, Dr. Moir, Dr. Chuckerbutty, Dr. Cleghorn, and others have borne testimony to its value as a remedy in chronic dysentery, in diarrhœa, in some dyspeptic conditions, and in bowel complaints of children. I shall refer to some of their remarks on the subject, and then, in conclusion, briefly notice the conditions of disease in which I think the bael is likely to be useful in Europe.

Mr. A. Grant says:—"Given in the form of sherbet, it acts as an aperient to persons subject to habitual constipation; a small tumblerful taken in the morning will produce action of the bowels. In cases where dyspepsia is accompanied by obscure symptoms of land-scurvy, it seems to act favourably, and produce alterative as well as antiscorbutic effects." To this I may add, on my own part, in the irregular action of the bowels, diarrhœa alternating with constipation, when the abdomen is distended, the appetite bad, the secretions defective, and the nervous system depressed, as one so often sees in the damp, tepid atmosphere of Bengal, especially towards the end of the rains, when the mucous membrane of the intestinal canal is disordered and in a state of atony, the bael is not unfrequently an effective remedy, and, at all events, gives some relief, acting either as a laxative or tonic, according to circumstances, by stimulating the bowel to more healthy action, and, combining with the ingesta, seems to promote digestion and assimilation. In the low and chronic forms of diarrhœa, among the weak and exhausted from whatever cause, whether as the sequel of malarious poisoning, fever, or dysentery, it may prove of benefit where opium and ordinary astringents have failed; or it may be still more beneficial in combination with these remedies; and

19 deaths; in the latter to 440, with 266 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

Mr. Grant says that when he wanted to produce a more stimulating effect in asthenic cases, he combined it with the tharrie or palm spirit. He mentions several cases of subacute dysentery successfully treated.

Dr. John Jackson, Dr. Duncan Stewart of Calcutta, and Sir R. Martin have borne similar testimony to its utility, not only as an astringent, but as a preventive of diarrhœa in persons subject to that complaint, and also as a valuable agent in the treatment of some of the more chronic forms of dysentery. Dr. Jackson speaks favourably of its value in the treatment of the diarrhœa that sometimes follows cholera.

Dr. Cleghorn says it has proved useful not only in obstinate diarrhœa, but in the irritability of the mucous membrane of the intestine that followed the expulsion of tænia by kousso. Mr. Sanderson, a distinguished medical officer of Madras, speaks well of it.

Sir R. Martin made the following remarks:—"On what the curative property depends I know not; it is certainly not astringent to the taste, or at all events very slightly so. I am inclined to believe that much of its efficacy may reside in the thick mucilage which surrounds the seeds of the fruit. A singular property of the fruit is this, that it does not merely restrain undue action of the bowels, as in diarrhœa and dysentery, but also in cases of obstinate habitual constipation acts as a mild and certain laxative. It may in all cases be said *to regulate the bowels.*"—*Lancet*, July, 1853, page 53.

Dr. Moore, of the Bombay Medical Department, who, at the instance of Government, has written a popular work on Medicine, for the use of persons away from medical aid, for which he received the reward offered for the best essay, says:—"It acts as an astringent to the mucous membrane

of the bowels, and is also slightly aperient, a union of qualities not found in other astringents. It is useful in chronic diarrhœa and dysentery."

In the March (28) number of the *Indian Medical Gazette*, I find the following remarks by an officer, who—as is often the case in India—being left to his own resources for medical assistance, had been obliged to fall back on such knowledge as he had, or could gather from books, and treat as he best might the complaints occurring in natives or others who were serving under him in that particular locality. India is not a country for specialists, and men holding responsible offices are often obliged to be their own doctors. The writer is Colonel Parsons, Deputy Commissioner of Gujerat, in the Punjaub:—

"My attention was first called to the subject some years ago by a brother officer when I was stationed in a very damp district, where diarrhœa and dysentery were not uncommon complaints. I was myself attacked with the latter form of disease, which rapidly disappeared under bael treatment. Since then I have frequently been in localities where European medical officers were not always present, and I have suggested and administered the same remedy to both Europeans and natives suffering from either of the above complaints, and invariably the bael has caused most satisfactory results.

"The subject of the use of bael is not by any means a new one, and I believe the fruit is extensively used for medicinal purposes by Presidency surgeons; but as far as my experience goes, it might with great advantage be much more used in Upper India for the above complaints than it is at present. I feel sure that a great deal of mortality in English regiments from the scourge of dysentery would be saved by the free use of bael fruit, as I have found its effects absolutely

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In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

marvellous, both as regards rapidity of action and effectual cure. I believe that Pogson's preparation of bael was tried in the army; but I am not aware whether it was considered efficacious. I did not find it of use. The fresh fruit is the best form, but that is not always procurable. I have, however, found Bathgate's dietetic bael all that could be desired in the absence of the fresh fruit. The mode of administering the fresh fruit I have always adopted is to strain the juice from the pulp through muslin, add a little water and sugar; it then makes a very palatable drink. Two baels a day (this applies to small ones), of the size of an orange, one in the early morning, the other in the evening, I have found sufficient to effect a cure in a very few days, provided animal food be avoided or very sparingly used."

I might easily add to these attestations in its favour, but it would be tedious and wearisome to do so. I will just remark that you may observe that all tell much the same story, and declare it to be a valuable remedy in certain chronic diseased conditions of the *primæ viæ*; but by none is it regarded as a remedy for acute disease. It is a mistake, not unfrequently made, to give remedies at the wrong time; and this is sometimes done in the case of bael, which consequently has been unjustly blamed for not doing that to which it never had any pretensions. As a remedy in chronic disease it may be of much value, but it is useless in the acute forms. The conditions in which it is likely to be useful in India, I have already indicated; and I must now bring these remarks to a close with a brief description of the cases in which, if the fresh fruit can be imported, or if the pharmaceutists can make us an active preparation, it is likely to be useful here.

In the chronic condition of dysentery into which the bowel is apt to pass when it is thickened, perhaps ulcerated and indurated from cicatrisation, and subject to frequent recurrence of subacute inflammation and dysenteric action, indicated by straining and the discharge of mucus and blood, and where the entire intestinal mucous membrane is sympathetically involved, the use of the fresh bael taken in the form of sherbet is likely to be of service. It will not always alone be sufficient, and it may be necessary to combine it with other remedies, such as opium or Dover's powder, but as an adjuvant to these or to astringents it may be beneficial; and from the power it possesses of giving tone to the alimentary canal generally, of improving the condition of the mucous membrane and its glandular apparatus, and of favouring cicatrisation, it will not unfrequently aid in producing satisfactory results where other remedies have failed. Vegetable and metallic astringents and tonics, such as kino, catechu, tannin, hæmatoxylon, eucalyptus, Wrightii antidysenterica, pomegranate, sulphate of copper, acetate of lead, alone or combined with opium, frequently give temporary relief, though ultimately they prove insufficient; the disease continues to advance, and the patient to lose ground; the least error in diet, or alteration in temperature or in the hygrometric condition of the air, aggravating the symptoms until change of climate is resorted to. Such cases are not infrequent here, and may be seen on board the homeward-bound steamers and at English and Continental health-resorts. No doubt they have taken the wisest and most effective step for restoration of health in coming home—one in comparison with which drugs are insignificant. In such cases the bael is indicated, and I believe would often materially aid in restoring the diseased intestine to its normal condition.

79 deaths; in the latter to 410, with 206 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

Of course it is not likely to meet all the morbid conditions that may arise in cases of chronic dysentery, and I need hardly remind you that any recurrence of acute symptoms may need active treatment by ipecacuanha, Dover's powder, injections of opium in solution of gum or arrowroot. In the chronic states of which I speak, I think you will find under its influence that the reparative changes in the large intestine progress quietly and favourably, until cicatrisation is accomplished, thickening is removed, and, as far as may be, tone, vigour, and healthy action are restored.

But, unhappily, many cases have not this favourable termination under any circumstances, and the result is fatal, after long and severe suffering; the structural changes in the bowel are beyond repair, and the patient succumbs. In other cases the disease, though not fatal, is very tedious; the cicatrix may be formed, but the gut remains thickened, indurated, and contracted, by loss of the mucous membrane from dysenteric sloughing; the functions of the bowels are imperfectly performed; a condition of chronic disease and suffering remains, diarrhœa, sometimes dysenteric in character, continues, and the patient is worn and wasted by continued suffering. The evacuations are light-coloured—grey, sometimes yellowish; often passed without pain or tenesmus; but at times accompanied by both, and mingled with blood and mucus. These conditions ultimately undermine the strength, and the patient may sink from exhaustion. In the stages that lead to this state of things the bael is more likely to be of service in retarding, if not of altogether checking, the mischief, than remedies that have a more directly astringent action.

Chronic cases of dysentery of a milder character not unfrequently come under our notice. There is thickening

and perhaps contraction of the large intestine, which may be felt through the abdominal wall, with or without tenderness on pressure. The general health may be improving, indeed, may be fairly good (the appetite, too, good); and all seems comparatively well, except that the bowels are irregular—sometimes confined, at others relaxed. There is straining, and the evacuations are mingled with mucus and sometimes blood. The patient suffers much at times, and is in constant danger of relapse. In this state diet is of the utmost importance; the bowels should be kept regular with occasional doses of oil, or the tepid-water enema. No active drugs are needed, but in such cases the bael sherbet would, I think, be often useful.

Again, either as a sequel of dysentery, or altogether independent of it, an intractable and obstinate form of diarrhœa is met with, especially in persons who have been long in India, China, or other tropical and malarious climates. The diarrhœa sometimes called "alba, or white flux," described by Mr. A. Grant in the *Indian Annals*, is a painless disease, characterised by frequent, liquid, light-coloured, frothy motions, which gradually reduce the strength and exhaust the vital energy. The person slowly wastes and becomes anæmic, his skin is harsh and dry, his abdomen tumid, the tongue red and dry, the papillæ gradually shrink, until in the later stages they disappear altogether, and the tongue becomes smooth, polished, and glazed, or it is coated with white layers of epithelium, which also form on the mucous membrane of the mouth and fauces, often accompanied by aphthous spots.

There is not necessarily evidence of structural changes in the liver or spleen; indeed, there is reason to believe that these organs only share in the wasting or shrinking of

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the body generally; and so it is found in fatal cases; and also that the whole intestinal tube is thinned, almost transparent, the mucous membrane softened, and the glandular structures wasted or destroyed; not unfrequently a certain amount of ulceration being observed, especially towards the lower portion of the ileum and in the large gut.

Digestion, absorption, and assimilation are all interfered with, and gradual wasting from inanition results. This condition of disease is frequently seen in the hill stations of India, but most generally in those persons whose constitutions have already been damaged by long residence in the plains. It is also seen in some who have never been in the hills at all.

Early removal to another climate is the best, and, indeed, the essential remedy; and it is, I believe, absolutely necessary in many cases, to save life. The great mistake generally made is of not resorting to it sufficiently early, and before progressive degenerative changes have gone so far as to be irreparable. In this form of diarrhœa, diet is a most important element in the treatment, and it should be of the blandest, most unirritating kind—milk, animal butter, farinaceous food—which will not always agree, and careful abstinence from over-stimulation either by alcohol or any other form. All forms of medicine have been tried with more or less good effect—opiates in small and repeated doses, either as laudanum or Dover's powder, often giving the greatest and most enduring relief; astringents at times being beneficial, but often failing miserably to do any good.

Now, in such cases, before they leave India, it has sometimes been found that the fresh bael sherbet has produced excellent effects, and done more good than any other remedy. Such are far from uncommon in England in the cases of

Indian officers or others, who come home for the purpose of shaking off a complaint that they find is steadily getting worse in India; and it is with the hope of providing a remedy for such that I am anxious this popular Indian remedy should be better known and more used in England.

After all, medicine of any kind, however efficacious, is of secondary importance to change of climate, carefully regulated diet, and scrupulous avoidance of chills and cold by extra warmth of woollen dress, which should never be neglected. A remedy that has often produced happy results in India, could hardly fail, I think, to be even more satisfactory here, where it would have the advantage of the improved climate and other conditions of life to give effect to its beneficial action.

I have given you but a mere outline of the diseased conditions in which the use of bael may be advocated; but my object was rather an account of the remedy than a clinical lecture on the diseases in which it is useful. And as I have already, I fear, exhausted your patience, I must conclude by saying that, though the subject has been rather a dry one, yet I hope it has not been altogether uninteresting.

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With the Author's Compliments

ON SCROFULA, TUBERCULOSIS, AND PHTHISIS IN INDIA.

By JOSEPH EWART, M.D.

[*Read: April 6th*, 1881.]

Prior to the year 1840, we do not find much mention made regarding the existence of scrofula, tuberculosis, and phthisis pulmonalis among the indigenous population of India. This want of practical acquaintance with these pathological conditions was, probably, due to the imperfect utilisation of Laennec's system of auscultation and physical diagnosis; the extreme difficulty, in former times, of obtaining *post-mortem* examinations, in native cases; their frequent latency and liability to be masked by bowel complaints. In 1844 and 1845, Dr. W. A. Green proved the existence of phthisis among the natives of Howrah and Midnapore. In 1845, Dr. Edward Goodeve, whose recent demise was so touchingly commemorated in the President's address inaugurating the present Session of the Society, made similar observations among the people frequenting the civil hospital and dispensary at Cawnpore. It is remarked in the *Pathologia Indica*, published in 1848, by the late Dr. Allan Webb, that he had diagnosed phthisis among the Hindu race (Paharrees, hill-men) inhabiting the lower belt of the Himalaya range of mountains, and at Burdwan in Lower Bengal. In 1854, Dr. T. W. Wilson, in a thoughtful and elaborate paper, entitled "Tubercular Disease in the East", published in the *Indian Annals of Medical Science*, recalled attention to the subject, with a view to dispel the belief then entertained in England, regarding the supposed exemption of natives and Europeans in the East Indies from it. In 1856, Dr. Morehead (*Researches of Diseases in India*, vol. ii, pp. 394-419) relates his experience of phthisis pulmonalis, at the European General Hospital, Bombay, from 1838 to 1853; and among natives admitted into the Jamsetjee Jejeebhoy Hospital, Bombay, from 1848 to 1853. In the former, the admissions amounted to 184, with 79 deaths; in the latter to 445, with 268 deaths.

In my Address on Medicine, delivered at the Annual Meeting of the Bengal Branch of the British Medical Asso-

ciation, 1867-68, it was shewn that, during the ten years, from 1857 to 1867, 454 cases of phthisis occurred in natives treated in the Calcutta Medical College Hospital, of whom 285 died; that, from 1860 to 1867, 729 cases were diagnosed at the out-door dispensary of this institution, almost all of which took place among natives; and that, among Christians (a very mixed class of persons), during the decennium 1857 to 1867, there were treated, as in-door patients, 351 cases, with 139 deaths. A brief summary of sixty preparations, preserved in the College Museum, was also recorded in this Address, demonstrating the development "of tuberculosis in the lungs, larynx, trachea, mesenteric glands, subperitoneal connective tissue, intestinal glands (solitary and agminated), liver, spleen, arachnoid, kidneys and testes of natives of pure descent; and, also, of a few East Indians, who were born and reared in the country".

But there is good reason for the belief that the experience of developed phthisis, derived from hospital and private practice, affords only a partial criterion of the real prevalence of the tubercular diathesis, and disease in India. It not infrequently happens that grey miliary tubercles are discovered—sometimes in small, sometimes in large numbers, diffused, isolated, or in clusters—seemingly quiescent, and causing no great amount of local mischief, if adjacent emphysema be excepted; or the chalky remains of these and their consequent inflammatory exudations are found in the apices of the lungs, in the bronchial, or mesenteric glands of young natives who have succumbed to cholera, severe forms of specific, or malarious fevers, dysentery, or diarrhœa, and other acute forms of disease supervening upon malarious anæmia, and cachexia. In many of these cases, the history has pointed to repeated recurrences of malarial fever, with enlargement of the spleen, resulting in confirmed anæmia—in some, leucocythæmia, or leukæmia—succeeded, or accompanied by diarrhœa, terminating in asthenic, and unmanageable dysentery, but the lungs may never have been made the subject of complaint. In such cases, death may often be said to have been caused by intercurrent diarrhœa or dysentery before the tubercular diathesis had had time to end in active pulmonary consumption. It may, possibly, have been a consideration of such facts as these that induced the late Allan Webb, in 1848, to propound the doctrine that, at that time and previously, the reason why so many phthisical patients had been, and still remained, unrecognised, was that they were constantly carried off by diarrhœa, ending in dysentery; or by dysentery only, before the growth of tubercle had taken place in such

quantity in the lungs as to materially impair their functions, or to lead to their serious disintegration or disorganisation. He also, it may here be mentioned, regarded the hypothesis that, in this class of cases, the tuberculous material was diverted to the glandular structures of the intestinal mucous membrane, and, in great part, got rid of in the discharges, thus relieving proportionately the pulmonary organs. Be this, however, as it may, it is not difficult to understand how, in a person afflicted with the tubercular diathesis, inherited or acquired, bowel complaint may prove mortal without a single manifestation of its expression in the form of tubercle, grey or cheesy, being discovered in any part of the body after death, and how this constitutional proclivity sometimes, especially among the European soldiers, and their wives and children, and among the prisoners in the more overcrowded and unhealthy gaols, makes the dysentery of India uncontrollable or non-amenable to influence and action of moderately large doses of ipecacuanha.

Admitting all the above-mentioned facts elucidating the prevalence of phthisis among the various classes of the community in India, there is evidence, in the army returns, published by Bryden, calculated to show that phthisis is not nearly so prevalent among the native as among the European soldiers and their women and children. With the exception of Lower Bengal and Assam, in which the prisoners are still, it is feared, greatly overcrowded, this observation is upheld in drawing a corresponding comparison between the gaol population and the British soldiers, their wives and children. The figures I am about to quote, in support of these general statements, embrace six years, 1871-76.

Thus, the ratio of admissions per 1,000 of strength with phthisis amounted to 9.0 among the soldiers of the European army of India, to 8.8 among those of Bengal, to 10.8 among those of Madras, and to 9.0 among those of Bombay; to 9.6 among the women of the European army of India, to 10.4 among those of Bengal, to 8.0 among those of Madras, and 8.7 among those of Bombay; to 8.3 among the children of the European army of India, to 8.2 among those of Bengal, to 8.7 among those of Madras, and 8.2 among those of Bombay.

According to Professor Aitken,* the ratio varied in the American army, during 1861 to 1863, from 8 to 9 per 1,000, and in the British army, during 1861 to 1862, from 9 to 10 per 1,000 of mean strength.

In the native army of the Bengal Presidency, the corresponding ratio, during 1871 to 1876, amounted to 2.5, in that

* *Practice of Medicine*, vol. ii, p. 846, sixth edition.

of Bengal proper and Assam, to 3.9, in that of the Gangetic provinces, to 2.9, in that of Rohilcund and Meerut, to 3.0, in that of Agra and Central India, to 2.6, in that of the Punjab, to 1.6, in that of the Punjab frontier force, to 2.1, and in that of the Central India irregular force to 0.8.

For the same period, in the gaol population of the Bengal Presidency, the ratio of admissions per *mille* with phthisis amounted to 4.2, in that of Lower Bengal and Assam, to 8.9, in that of the Gangetic provinces and Oude, to 3.2, in that of the Central provinces (excluding Saugor and Jubbulpore), to 1.5, in that of Agra and Central India to 2.1, in that of Rohilcund and Meerut to 2.8, and that of the Punjab to 2.1.

These results warrant the inference that phthisis is much less prevalent among the native population of India than among the inhabitants of these islands, or among the British soldiers and their families located in India. And a comparison of the rate of prevalence among these latter classes, with that of their *confrères* quartered in the United Kingdom, shows that a transfer to India in no way materially diminishes the admissions from this mortal disease.

The figures used here only give arithmetical expression to facts which have long been known to the clinical physician in all parts of British India. One of the first things which strikes him, when contrasting his home with his Oriental experience, is the preponderance of abdominal disease among his patients over affections of the thoracic viscera. The comparative infrequency of tubercular disease of the lungs forms no exception to the predominating rule, even when full allowance has been made for latent and undiscovered tubercle. It is quite rare and exceptional to hear of whole families, or even of several members of a native family, being carried off by phthisis. White swellings of joints, and strumous enlargements of the glands, or cicatrices, resulting from suppurating scrofulous glands, are comparatively infrequent. To contribute some partial explanation of the facts hereinbefore advanced, as far as our knowledge will admit, and as briefly as may be consistent with doing justice to the subject, will be the object of the subsequent observations.

1. *The Influence of Fresh Air and Living much in the Open Air.*—In the *Lancet* of the 6th of January 1866, p. 20, Dr. Henry Bennet wrote as follows:—"Singularly enough, I believe, I am the first, and as yet the only writer on climate, who has recognised and forcibly insisted on the all-important and self-evident fact that consumptive patients should reside, winter or summer, in England or abroad, where they can

breathe pure air, night and day, that is, in the country in healthy villages, and in the healthy outskirts of towns. Their breathing pure air is of infinitely more importance than a few degrees of temperature more or less, or a little more or less protection from this or that wind. A fact so consonant with modern physiology and pathology has only to be brought forward to be universally acknowledged, and the time is near when medical men will wonder how they could ever think of cooping up patients in unhealthy southern towns for the sake of mere warmth." Doubtless, much of the exemption from consumption enjoyed by the natives of India is largely due to the general conformity with the principles herein inculcated. By far the greatest proportion of the people are engaged directly and indirectly in the cultivation of the soil. Out-door occupation is the prevailing rule. The huts and houses in which they dwell, whether in villages, towns, or hamlets, are full of crevices, chinks and openings, so that anything like the overcrowding and breathing of air which has already been utilised in respiration is not nearly so marked as in colder latitudes. The mildness and warmth of the climate during the greater part of the year renders a breezy circulation of air,—against which the habitations, the sleeping rooms especially, in frigid and temperate climates are religiously constructed,—in tropical regions welcome, healthy and antiseptic. Cellar life, or the living in rooms below the level of the ground, even in the largest cities, is unknown. The ingress of air from without, and the egress of it from within, native dwellings, in town and country, is uninterruptedly going on, night and day, by natural ventilation, with a windy and draughty freedom made agreeable to the people by a generally warm atmosphere. This is a very different state of matters when compared with the stuffy, close, and ill-ventilated bedrooms of this and other temperate countries. Both in towns and in the country, a considerable portion of the twenty-four hours is passed practically in the open air, in open houses, rooms, courtyards, verandahs, or in the fields. The respiring of air, which has already been recently breathed, is thus in great part prevented. And, though the air must often be loaded with impurities derived from the insanitary condition of most of the cities, towns, and villages of the country, yet, owing to free perflation and ventilation of native dwellings, its contamination with the organic products of respiration is, in large measure, reduced to a comparative minimum. This source of the ill-health and impoverishment of blood, conducing to scrofulous and tuberculous dyscrasia, is considerably minimised in India, and

something of the diminished liability of the natives to consumption must be ascribed to the greater freedom of the air breathed from the noxious products of that which has already been respired.

2. *The Influence of the Food Chiefly Consumed.*—Although, as was pointed out in my work on the *Sanitary Conditions of Indian Gaols*, there are no exclusive vegetable feeders among the peoples of India, it must, nevertheless, be admitted that, in all classes, and more especially in the case of the Hindus, the dietaries are mainly constituted of vegetable aliment. Among the population inhabiting the low-lying and alluvial lands of Bengal, Assam, and near the sea coast in Madras and Bombay, and in the vicinity of rivers and lakes in the interior of the country, the staple article of consumption is rice, affording, with a small proportion of nitrogenous, a large excess of the carboniferous aliment. The latter is supplemented by the Hindus by means of milk, dhal, or curds, fish, fowls, etc., but principally by the various species of dhal and other leguminous seeds, rich in nitrogenous matter. Fruit, ripe or unripe, and dried and green vegetables are universally consumed. The cooking is excellent, and the seasoning of the food with spices and condiments irreproachable. Abundance of good salt is now available to the poorest as to the richest classes of the community. In the uplands of the aforesaid provinces, in the North-west, Punjab, Central Provinces, Deccan, Rajputana, the staple article of diet is wheat, whilst in Madras it is raggy (elucine corocana), cholum (holcus sorgum), chumboo (holcus spicatus), all of which are rich in nitrogenous nutriment. In these parts rice is a luxury, and mainly used by the well-to-do. Dhal, also, is not so much consumed as it is in those provinces where rice is the chief element of the food. Milk and curds, fish and fowls are abundantly partaken of. Oleaginous aliment is represented by melted butter, or ghee, the oil of the cocoanut, olive, linseed, mustard, etc. The Mahomedans consume more flesh meat than the Hindus, such as kid, fowl, mutton, and beef. The bread made from wheat and other highly nitrogenised grains includes kernel, and a large quantity of husk, and is unleavened, and baked in the form of chupattie (a small and thin cake). On the whole, it may be roundly said that, among all classes, wholesome vegetable aliment, presented to the stomach in an easily digestible dress, constitutes the leading feature of the indigenous dietaries, whilst, in a much smaller proportion than is the case in this country, food of animal origin is eaten. Here the relative proportion of the nitrogenous and non-nitrogenous nutriment is

somewhat reversed. There is too much of the former, too little of the latter, and it is probable that the quantity of oily food of the most digestible kind is deficient in the dietary of those classes most liable to scrofula, tuberculosis, and phthisis. With such simply constructed dietaries as those used by the people of India, the proteine and albuminous principles are represented in quantity and quality suited to them and the climate in which they form the permanent population, whilst the amylaceous, saccharine, and oleaginous principles exist—it may be—in such an undue proportion as to favour premature degenerations of a fatty rather than of an albuminous nature. If there be a germ of truth in this part of my explanation; if the mild and comparatively unstimulating nature of the food employed by the people has something to say in lessening the proclivity to tuberculosis in India, then it may be assumed that, coupled with the general temperance in the matter of alcoholic liquors, it has, in the course of the several thousand years, during which it has remained practically unchanged, as to its nature, quality, and mode of preparation, exercised a potent influence in preventing the acquirement, and in restricting the inheritance of the scrofulous diathesis. Nor should the probable protective power of the prevailing custom of the protracted suckling of the young, often beyond the completion of the first dentition, be omitted from consideration.

3. *The Influence of High Temperature in Lessening the Frequency and Mitigating the Severity of Bronchial, Pulmonary, and Pleuritic Disease.*—Although coryza, bronchitis, pneumonia, and pleurisy may be seen in the autumn and cold months as primary affections, they are, particularly the three last-mentioned diseases, most frequently met with, in an asthenic form, as sequelæ, or complications of malarious and other fevers. The cold bath daily had recourse to by almost all classes, high and low, affords a great protection against colds, nasal, and bronchial catarrhs. Moreover, the skin of the natives being so much directly exposed and regularly subjected to inunction becomes inured to withstand, to an extraordinary degree, vicissitudes of temperature; still, in the autumnal and cold seasons, when the thermometric range is at the greatest, and when the radiation of heat from the surface is extreme, the advent of these affections is favoured. But, it may be formulated that, owing to the usually high temperature of the atmosphere, the inflammatory diseases of the mucous membranes of the air-passages are less potential in exciting tuberculosis of the bronchial glands and pulmonary parenchyma than in frigid and temperate latitudes.

Even in the cold months, when these complaints mostly prevail, they seldom succeed in lighting up, as they so commonly do here, tubercular disease in the apices of the lungs. The reason of this comparative exemption is probably to be found in the absence of the tubercular diathesis—acquired, or inherited. In disposing of this part of my subject, not only the mildness of an Indian winter, which, in most parts of the plains, is much warmer than our warmest summer in England, but its shortness, varying from two to four months or so, must be borne in mind.

4. *Influence of the Diminished Prevalence of Measles, Whooping-Cough, Scarlatina, Mumps, etc.*—The influence of these diseases in the production of scrofula is widely acknowledged. The two first and last exist in India; but to a much smaller extent than in Europe. Moreover, when measles do occur, the catarrhal and bronchial mischief is much mitigated by the warmth of the climate. Scarlatina has, I believe, only been recognised in a few isolated instances, as imported into Bombay or Calcutta by canal steamers, but it has not been known to spread as an epidemic. The red fever, described by Goodeve, and the dengue, pictured by Charles, are not accompanied by any special nasal or bronchial catarrh. It may fairly be claimed that we have in the considerable exemption of the native children of India from these scrofula-generating diseases one very important reason why tuberculosis is less frequent in India than in Europe.

5. *Influence of the Infrequency of Scrofula.*—Partly on account of the general great freedom of the native children from those diseases of childhood which are potential in developing scrofula, this, the parent of much tuberculosis, is not so commonly met with in India as in this country. That this is the correct explanation is countenanced by the fact that the diarrhœa of native children is not very frequently followed or accompanied by tabes mesenterica, or cheesy infiltration of the mesenteric glands. Webb, as I have previously remarked, believed that such diarrhœas were a medium for the elimination of tubercular matter from the system. But do we find that, though tainted matters may be expectorated during bronchial catarrh, in a child or youth of scrofulous diathesis, or actually suffering from confirmed phthisis, the growth of tubercle is, as a general rule, materially diminished? Do we not rather discover, in most instances, that with each succeeding bronchitis, the tuberculosis has extended? It may, however, be argued that the cases are not quite parallel, inasmuch as the products of scrofulous inflammation of the bronchial mucous membrane, or of the pulmonary parenchyma, cannot be so easily ejected; and that tainted endothelial elements are more likely to be absorbed by the interlobular lymphatics and capillaries, and thus tend to aggravation rather than relief, than in the case of the intestinal mucous membrane and its adenoid bodies, where, owing to exalted peristalsis, all abnormal products are more rapidly expelled. If, it may be contended, as sometimes happens, a localised cheesy mass may be successfully broken down and extruded from the apex of the lung, and followed by a certain measure of repair and cicatrisation, why should not this process much more frequently succeed when the scrofulous inflammation is concentrated in the glands of the mucous membrane of the intestine, provided with far greater facilities, than are the lungs and bronchi, for the speedy escape of the offending matter? But if, as may be conceded, such a termination may possibly be more frequent, in the case of tubercular solitary or agminated glands, there is no good reason for believing that it takes place so commonly as to account for the comparative immunity of the youths of India from scrofula, tuberculosis, and phthisis. In these glands, as in the lungs, the process of disintegration is slow and tedious, repair difficult and exceptional, and, during the inflammatory and ulcerative process, the rule is to implicate the lymphatics and mesenteric glands, and to cause their infiltration with scrofulous material. But, as has been observed, this is seldom the result of the diarrhœa of native children and youths—much less frequently than one would expect, were it associated, in its initiation, causation or course, with the scrofulous or tubercular diathesis.

The old theory of a supposed antagonism between tuberculosis, or phthisis and malaria, has been abandoned. That phthisis occurs in malarious localities has been sufficiently well proved. If, in India, the diathesis favouring its development is not so prevalent as in many non-malarious countries, this comparative immunity need not be assigned to any active antagonism between it and malaria, but rather to the almost universal respiration of air, in an unusual degree, uncontaminated with the organic and other products of that which has already been breathed; to the antiscrofulous nature of the food consumed; the existence of an elevated air temperature, which is, in a great measure, antagonistic to inflammatory diseases of the air-channels and cells, and conducive to easy recovery from them when they do supervene either in their primary or secondary forms; very great freedom from those exanthemata and other diseases of childhood which, in other countries, are so often accompanied or succeeded by

strumous affections; and to a somewhat exceptional immunity from the scrofulous diathesis. Still, seeing the immense amount of extreme anæmia and cachexia caused by malaria, and a remarkably disproportionate prevalence of tuberculosis, side by side, the natural inference is that, though the poisons may not be antagonistic, there does not seem to be much in common between them. But this, to my mind, is only another of the several proofs given in this communication that either the scrofulous diathesis is altogether absent, or so completely dormant in a vast majority of native children and youths that even the tropical anæmia and terrible cachexia of prolonged malarial disease are incapable of leading to the development of tuberculosis or phthisis in either corresponding degree or frequency. When, however, on the other hand, this proclivity exists as an inheritance, or has been acquired, as in European soldiers, and their families, in Eurasians or half-castes, and in native convicts in the overcrowded prisons of Bengal, Assam, and the Gangetic provinces, malarial cachexia does not oppose, but may be rather said to facilitate the advance of tuberculosis and phthisis.

Before drawing these observations to a close, I propose to answer, as far as my experience will justify my doing so, the question whether longevity is promoted by transferring persons predisposed to, or suffering from, tuberculosis or confirmed phthisis from this and other temperate latitudes to the Plains of India. There is an impression that persons born of phthisical parents, but in whom there is no tangible evidence of tubercular deposit in any part of the body, do better in that country than at home. They certainly escape, to a marked extent, the frequent attacks of bronchial catarrh, pneumonia, and pleurisy, which are rightly associated with the excitement of tubercular activity in the bronchial glands and the pulmonary parenchyma. The greater exemption of children and youths from measles, scarlatina, whooping-cough and mumps, is also an additional advantage. The warmth of the climate, the free action of the skin, so long as it is not excessive or profuse, and the increased expansion of the chest-walls to compensate for the rarefaction of the air, are all favourable. But these advantages are counterbalanced by the great heat and malariousness of the plains, which, even in those individuals who may have been fortunate enough to escape recurrent attacks of paroxysmal fevers, eventually lead to anæmia and debility, conditions which are favourable to the development of tubercle in those diathetically predisposed. These advantages are still more powerfully counteracted by repeated invasions of intermittent fever, and seasoning febrile affections, ending in malarious cachexia and dyscrasia, and defection in the power of generating animal heat. Add to these a predominating proclivity to bowel complaints, and the difficulty of obtaining, in such an exhausting climate, sufficient exercise to perfect function, and to confer tone upon the nervous and muscular systems, and then not much will remain to be said in favour of advising those descended from consumptive ancestors to exchange a career at home for one in any part of the plains of British India. Cases may be cited which have done well, particularly in the drier climates of Mysore, some parts of Rajputana, of the Central Provinces, of the North-West Provinces, and the Punjab, but such exceptions are not peculiar to India, and I do not find that these occur more frequently there than in England, or in other countries where phthisis prevails, and is a most constant and important contributor to the bills of mortality.

When there is unmistakeable evidence of tubercular growth in the apex of either or both lungs, or when phthisis has become pronounced, clinical observation of Europeans so affected clearly leans to the view that they derive no benefit whatever from residence in India. The causes already mentioned, which are potential in exciting tuberculosis in those persons inheriting a scrofulous diathesis, operate with redoubled energy and effect where tubercle, whether hereditary or acquired, has been formed. Rightly interpreted, they go far to explain why, in such cases, the tendency is rather to progressive augmentation of the tubercle in the lungs than to its arrest or diminution, with or without, as the disease advances, tubercular ulceration of the solitary glands of the large and small intestine, and of the agminated glands of the ileum.

ON THE PATHOLOGY AND TREATMENT OF SHOCK AND SYNCOPE.

ON THE PATHOLOGY AND TREATMENT OF SHOCK AND SYNCOPE.[1]

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THE assemblage of phenomena which we designate by the term "shock" is so much more frequently met with in surgical than in medical practice that it may almost seem that in writing a paper on this subject I have left the proper domain of the physician, and trespassed on that which the surgeon claims as his own. We shall hereafter see, however, that shock may occur in the course of diseases for which the physician alone is called into consultation, and it is intimately connected with fainting or syncope, a condition which is usually treated of in medical rather than in surgical text-books. So closely, indeed, are syncope and shock connected that they were considered by the celebrated surgeon, Travers,[2] to differ in degree rather than in kind, and we shall find it convenient to take a glance at the conditions which we find in syncope, before we proceed to examine those of shock.

I shall divide this paper into three parts. First, the injuries or impressions on the nervous system which occasion syncope and shock, and the symptoms which are observed in these conditions. Secondly, the causes of each symptom, and Thirdly, the re-

[1] Read before the Abernethian Society, St. Bartholomew's Hospital.
[2] Treatise on Constitutional Irritation, 1826, p. 466.

medies used and their mode of action. To put them shortly, these three heads are: 1. *The symptoms and causes;* 2. *The pathology;* and 3. *The treatment of shock and syncope.*

As I have already said, it will be convenient to consider the symptoms of syncope before those of shock. Having had little surgical experience myself, I shall quote very freely from the works of others; and the first case I shall give is one taken, not from a scientific work, but from the pages of a popular religious periodical. I cannot even vouch for the historical truth of the narrative, and yet I choose this case because we have records of numerous other ones which resemble it so much in one or more particulars, that we can hardly doubt the substantial accuracy of the description; and owing to the peculiar circumstances under which the events are said to have taken place, we find in this one instance all the phenomena which we would otherwise have to seek for: some in one case, some in another.

During the reign of Charles or James the Second, one of the Scottish Covenanters, named John Bruce, concealed himself from the dragoons who were in search of him at some little distance from his cottage, and his little daughter Alice was accustomed daily to visit him with a supply of provisions. One day, while on this errand, she was unhappily discovered and seized by the dragoons, who at once guessed her purpose from the food she was carrying, and declared that unless she informed them of the place of her father's concealment they would torture her with thumbscrews. She refused, and the instruments were accordingly applied. Scarcely, however, had a few turns of the screw been made, when her face became deadly pale, and she fell back insensible. The screw was at once undone, water from a neighbouring rivulet was dashed in her face, and after a deep sigh or two the paleness disappeared and consciousness returned. Again the dragoons demanded her secret, adding the threat that they would not let her off so easily this time. Again she refused, and the dragoons, irritated by her obstinacy, by a few rapid turns of the screw nearly crushed her thumbs between the jaws of the instrument. A second time the deadly pallor overspread her face, and unconsciousness relieved her pain. This did not suit the purpose of the dragoons, and they again

sought to restore her as before. But this time all their efforts were unavailing; the heart had ceased to beat, and the poor child was dead.

Here we have a typical instance, first of fainting, then of death by syncope, following the infliction of intense pain alone, without any injury whatever to the vital organs. Sometimes death may occur from an impression on the nervous system without even pain being felt, as in a case recorded by Sir Astley Cooper in his lectures on surgery.[1] "A healthy labourer belonging to the India House was attempting to lift a heavy weight, when another labourer came up and said, 'Stand on one side; let an abler man try.' At the same time he gave the former a slight blow on the region of the stomach, when the poor fellow immediately dropped down and expired. On examination of his body there was not any mark of violence discovered." This may be regarded as a typical instance of instant death from shock, but cases like it are comparatively rare. Usually the injury is succeeded by a period of depression of all the vital functions, and this may either end in death, pass into a state of excitement, or gradually disappear and give place at once to health without any intervening excitement.

The symptoms ordinarily observed in shock are well illustrated by a case which Professor Fischer has described in a clinical lecture on this subject.[2] From this I have made the following extracts:—"The patient, a strong, and perfectly healthy young man, was struck in the abdomen by the pole of a carriage drawn by runaway horses. No serious injury was done to any of the internal organs, at least we have not been able after a careful examination to find any trace of one. Nevertheless, the grave symptoms and the alarming look which he still presents made their appearance immediately after the accident. He lies as we see perfectly quiet, and pays no attention whatever to anything going on around him. His countenance is sunk and peculiarly elongated, his forehead is wrinkled, and his nostrils dilated. His weary, lustreless eyes are deeply sunk in their sockets, half-covered by his drooping eyelids, and surrounded by broad dark rings. The pupils are dilated, and re-

[1] Lectures on Surgery, from notes by Tyrrell, 1824, vol. i. p. 10.
[2] Volkmann's Sammlung Klinischer Vorträge, No. 10.

act slowly to the light. He stares purposelessly and apathetically, straight before him. His skin and such parts of the mucous membranes as are visible are pale as marble, and his hands and lips have a bluish tinge. Large drops of sweat hang on his forehead and eyebrows. His whole body feels cold to the hand, and a diminution in temperature is readily detected by the thermometer, which indicates a degree and a half in the axilla, and a degree centigrade in the rectum, below the normal. Sensibility is much blunted over the whole body, and only when a very painful impression is made on the patient does he fretfully pull a wry face and make a languid defensive movement. He does not move a single limb spontaneously, but after being repeatedly and urgently requested, he shows that he can still execute limited and brief movements with his extremities. If the limbs are lifted and then let go, they immediately fall as if dead. The sphincters remain closed in our patient, at least passage of urine and fæces has not been noticed since he came into the hospital. When drawn off with the catheter, the urine is found to be scanty and dense, but free from any traces of sugar or albumen. The pulse is almost imperceptible, irregular, unequal, and very rapid. The arteries are small, and the tension very low. While the patient was being brought to the hospital the pulse became quite imperceptible, and the cardiac sounds very irregular and intermittent. The patient is perfectly conscious: he replies very slowly and only when repeatedly and importunately questioned, but his answers are quite to the point. You heard how he gave the details of the accident reluctantly and imperfectly, but in the main correctly. Only while he was being brought to the hospital did he refuse to answer at all. His voice is hoarse and weak, but his articulation is good. On being repeatedly questioned the patient complains of cold, faintness, formication, and deadness of the extremities. When he shuts his eyes he becomes sick and giddy. His senses are perfectly acute. His respiration appears to be irregular, and abnormally long, deep and sighing inspirations alternate with very superficial ones, which are scarcely visible or audible. While being brought to the hospital he vomited several times, and nausea and hiccup still remain. Anyone who knew the patient, or had seen him shortly before the accident, could hardly

recognise him now. His appearance, cold skin, and hoarse voice immediately recall the appearance of a cholera patient to the memory of the attentive observer; the characteristic dejections are alone wanting to make the resemblance complete."

But cases of shock do not always present these appearances. If we call the form just described the torpid one, we can readily distinguish from it another erethismic form which Travers terms "prostration with excitement."[1] The countenances of patients suffering from it are distorted, and express a nameless anxiety and excruciating agony. They toss wildly about, groan and scream, and complain of a fearful oppression and want of breath, oppressive presentiments of death, and a feeling of total annihilation. No encouragement is of any use; they lament and behave themselves like madmen. The consciousness of these sleepless and restless patients is unclouded, but seems to be completely engaged by the frightful anguish. On this account they answer no questions, but only sigh and moan. They murmur to themselves, and pay no attention to what is going on around them. Such parts of the mucous membranes as are visible are pale, but the countenance, on the contrary, is slightly flushed, and the forehead hot; the eyes are sunk, but have a peculiar lustre, and the pupils are contracted. The skin of the extremities is generally cool and insensible, but not to the same degree as in the torpid form of shock seen in the case of the patient already described. Occasionally no coldness is perceptible. Vomiting of quantities of mucus and painful retching are constant and very obstinate symptoms of this form of shock. Burning thirst is present, and liquids are greedily swallowed, but no sooner are they down than they are again rejected. Every movement is made hastily and accompanied by a remarkable trembling. Occasionally all the limbs shiver as in a rigor, and the patient has no power to control the movement. A wounded officer in this condition repeatedly requested me, says Professor Fischer, not to consider it as a sign that he was afraid. Convulsive movements, and fibrillary twitches of the muscles, and especially of those in the face, are observable. The respiration is frequent and superficial, the pulse small and cannot be counted.

[1] Op. cit. p. 467.

Both these forms of shock may occur independently, but there is a certain connection between them. Patients recovering from the torpid form may come gradually to present the symptoms of the erethismic, and *vice versâ*, when the condition becomes worse, the torpid may be developed from the erethismic form. The latter is then to be regarded sometimes as an independent condition, and sometimes as a second stage of the torpid form.

Both forms of shock sometimes terminate in death, while at other times, according to Mr. Travers,[1] instead of the continuance and fatal increase of the symptoms of prostration, they may gradually give place to a partial and defective reaction, protracting life, but scarcely improving the prospect of restoration, which remains doubtful for several days in succession; or, on the contrary, an efficient and healthy degree of reaction may be quickly established consequent upon symptoms threatening the most unfavourable issue. "Again and again," he continues, "I have left the bedsides of patients brought into the hospital pulseless, and apparently moribund without any external injury, having suffered falls or blows so serious as to have induced the symptoms of prostration to an alarming extent, and have found them on the succeeding day, to my great surprise, restored to the tone and tranquillity, comparatively speaking, of health. Reaction has in these cases been spontaneous, or nearly so, although gradual enough to occupy a period of many hours." "Now, had such persons suffered topical injuries of a severe though reparable description, it is to my mind more than probable that reaction would have failed altogether; but had it, by favour of circumstances, been established it is at least, equally probable that it would have taken the form of excitement. In other cases days have elapsed before a perfect reaction and complete relief have been obtained."

Having said so much regarding the symptoms of shock, let us shortly run over its causes. The cases already related show us that it readily follows a blow on the abdomen, sometimes even when the blow is by no means severe. Injury to the genitals is another important cause of shock. Hardly

[1] Op. cit. p. 469.

anyone finishes his school days without receiving a blow on the testicles, either at cricket or during the struggles at football, and ever afterwards he bears vividly in mind the dreadful depression, weakness, and sickness which instantly overpowered him. The same thing takes place in operations, and Mr. Erichsen [1] has observed that at the moment of division of the spermatic cord in castration the pulse sinks even though the patient has been fully anasthetised. Still more striking are the effects occasionally observed on the passage of a catheter or bougie. They are thus described by Sir Astley Cooper:[2] "A person has a bougie passed into his urethra for the first time; the urethra is irritated by it; he says, 'I feel faint,' becomes sick, looks pale, and, without care, he drops at your feet. His pulse has nearly ceased, and his body is covered with a cold perspiration. You place him on a sofa with his head a little lower than his body, and as soon as the blood freely enters the brain all his functions are restored. Thus, by irritating the urethra the stomach is influenced, the actions of the head and heart are suspended, and the powers of the mind vanish."

Injuries to bones have a peculiar power to induce shock. It is, perhaps, more frequently observed as a consequence of the crushing of bones in railway accidents than of any other cause whatever. It may be said that in such cases all the textures of the limb, skin, fascia, muscles, vessels, and nerves are injured as much as the bones; but two cases of Pirogoff's[3] seem to show that it is to injury of the latter rather than of the former structures that the effect is to be attributed. In two amputations of the thigh which he performed, before the introduction of chloroform, death occurred on the operating table.

One case was for severe traumatic injury, the other for chronic disease of the knee-joint, which had greatly weakened the patient. In both cases the pain and loss of blood during the operation was only a little greater than usual, yet, in both, immediately after the bone had been sawn through the face became pale, the eyes staring, the pupils dilated, a peculiar rigidity of the body occurred, and death immediately took place.

[1] Science and Art of Surgery, 4th edit. p. 6.
[2] Lectures on Surgery, from notes by Tyrrell, 1824, vol. i. p. 9.
[3] Quoted by Fischer, op. cit. p. 10.

Extensive burns frequently cause shock in a marked degree, and such, says Mr. Travers,[1] is the effect of the transient bodily pain experienced in the extraction of a tooth, or the extirpation of a wart or corn, as in some persons to produce syncope, retching, or convulsions. Nor must the effect of mental emotion be left out of account, as this is sometimes sufficient of itself to cause death without any injury to the body whatever. Many years ago the janitor of King's College, Aberdeen, had rendered himself in some way obnoxious to the students, and they determined to punish him. They accordingly prepared a block and axe, which they conveyed to a lonely place, and having dressed themselves in black, some of them prepared to act as judges, and sent others of their company to bring him before them. When he saw the preparations which had been made he at first affected to treat the whole thing as a joke, but was solemnly assured by the students that they meant it in real earnest. They proceeded to try him, found him guilty, and told him to prepare for immediate death, for they were going to behead him then and there. The trembling janitor looked all round in the vain hope of seeing some indication that nothing was really meant, but stern looks everywhere met him, and one of the students proceeded to blindfold him. The poor man was made to kneel before the block, the executioner's axe was raised, but instead of the sharp edge a wet towel was brought smartly down on the back of the culprit's neck. This was all the students meant to do, and thinking that they had now frightened the janitor sufficiently, they undid the bandage which covered his eyes. To their astonishment and horror they found that he was dead.

Another case is related by Mr. Travers,[2] who saw a man suffering from strangulated hernia expire suddenly on the table during the steps preliminary to the operation which, from the state of the symptoms and of the bowel as ascertained by examination after death, might be said to afford the fairest prospect of relief.

The cases of shock of which we have so far spoken are perhaps more likely to come under the notice of the surgeon than of the physician. The state of shock, or collapse as it is more frequently called in medical practice, occurs when the

[1] Travers, op. cit. p. 74.

[2] Op. cit. p. 23.

abdominal viscera are injured from within, just as when they receive a blow from without. Thus the intense irritation which corrosive poisons, such as sulphuric and other mineral acids, or large doses of arsenic, occasion in the stomach, produces, in addition to local pain, coldness and pallor of the surface, sighing respiration, and weak or imperceptible pulse. The same thing occurs when perforation takes place in the stomach or intestines, and their contents escape into the peritoneal cavity. The occurrence of shock after parturition, especially in cases of twins, is probably partly due to nervous influence and partly to the removal of pressure from the abdominal vessels by the loss of such a large portion of the abdominal contents, which must almost unavoidably occasion more or less relaxation of the vessels.

To recapitulate shortly what we have said under this head, the *symptoms* of shock are: pallor and coldness of the skin, weak pulse, oppressed and sighing respiration, dilated pupil, and sickness.

The *causes* of shock are: painful impressions—more especially extensive burns—injuries to bones, and, above all, injuries to the abdominal viscera and genitals.

We have now to consider our second head, viz.: *The pathology of shock; or, the causes of each symptom.* I ought properly to take up every one and trace it back to its cause, but I shall not attempt to do this, because it would occupy too much time, and I am not sure I could at present succeed in the attempt. I shall, therefore, be content to glance at a few of the principal symptoms only.

And first:—Why should the pulse be small and weak and the tension in the artery low, so that a slight pressure with the finger is sufficient to compress its walls and completely arrest its pulsations? The smallness of the pulse wave under such conditions at once informs us that only a little blood is sent into the arteries at each contraction of the heart. This may be owing to the heart acting so feebly and imperfectly that it only sends out a small portion of the blood with which its cavity was filled, or it may be that it is doing its duty perfectly but has no blood to send out. It be would very hard to say which of these two causes is the true one, or whether they do not

both share in the production of shock, if we had not experiments on the lower animals to give us some clue to the true solution. Several years ago Professor Goltz, now of Strasburg, found that on striking the abdomen of a frog several times the heart stopped still altogether.[1] After a short pause it again went on, but instead of becoming completely full during each diastole, and sending a large volume of blood into the arteries at each systole, it remained pale and empty; no blood at all, or hardly any, flowed into it during the diastole, and consequently it could not send any into the vessels when it did contract, and it might just as well have remained motionless. On looking for the blood that ought to have been supplying the heart, he found that it was stagnating in the vessels of the abdomen, and especially in the veins. The intestinal vessels are so capacious that when they are fully dilated they can hold all the blood in the body. Normally, however, they are kept in a state of partial contraction by the influence of the vaso-motor nerves which supply them. It used to be supposed that these nerves only went to the arteries, and that these alone were capable of contraction and relaxation, but Goltz found that the veins also were supplied by vaso-motor nerves, and that they too could contract and dilate, though to a less extent than the arteries. Whenever the power of the vaso-motor nerves was destroyed, both arteries and veins dilated and held so much blood that there was not sufficient left to keep up the circulation in the rest of the body. If the frog was held in the upright position no blood at all reached the heart, but if it was laid horizontally a little blood trickled into the heart, and the circulation was thus kept up, though very weakly.

Here, then, we have in the frog the same effects produced by a blow on the abdomen, as in the case of the young man who was struck by the carriage pole, with this difference, that in the man we could only feel the weakness of the pulse, while in the frog we can see why it is weak. Professor Fischer says that the best and shortest definition of shock which has yet been given is that of Mr. Savory:—"Shock is the paralysing influence of a sudden and violent injury to nerves over the activity of the heart." The experiments of Goltz show that this

[1] Virchow's Archiv. xxvi. p. 11, and xxix. p. 394.

definition is perfectly correct, but you must not forget that there are the two factors in shock as seen in the frog. First, the stoppage of the heart; and second, dilatation of the vessels. These are quite distinct, and I have frequently observed that blows of moderate severity will produce in some frogs stoppage of the heart without dilatation of the vessels; in others vascular dilatation without arrest of the cardiac pulsations, although severe blows generally produce both.

The pallor of the surface and the coldness of the skin are the next symptoms which engage our attention, and what we have just learned regarding the circulation will render their explanation easy. The rosy flush of health is due simply to the red colour of the blood shining through the skin as it courses through the capillaries, and whenever the circulation is stopped, either by the vessels contracting as after exposure to cold, or by the blood stagnating in the abdomen as in shock, pallor overspreads the surface. The warmth of the external parts of the body is due to the warm blood from the interior, which heats them in the same way that rooms are warmed by hot-water pipes, and whenever the circulation ceases there is nothing to prevent the surface of the body being cooled down to the temperature of the surrounding medium, and such, in fact, does take place. The lividity or blueness which is occasionally observed, is due to the blood in the capillaries becoming dark and venous as it flows sluggishly through them, or even stagnates in them altogether when the circulation is very weak. I shall at present say nothing about the respiration or sickness, but pass on to consider the insensibility which we find in syncope though not in shock, and which distinguishes the former from the latter.

The functions of the brain, on whose failure insensibility depends, require for their performance a constant supply of blood, and when this is cut off they at once cease. A year or two ago, Dr. Waller proposed to produce temporary anæsthesia for short operations by compressing both carotids, or, in fact, garotting the patient; and I have been informed by my friend Mr. Image, of Bury St. Edmunds, that in Baron Larrey's Hôpital du gros Caillou, in Paris, it was the usual custom before the introduction of chloroform to lay a patient on his back, and then to lift him

up very suddenly to the standing posture, whenever they wished to induce fainting for the purpose of relaxing muscles in cases of dislocation. The vessels of the patient were carrying on the circulation all right while he was in the horizontal position, but they had not time to adapt themselves to the altered conditions when the man was placed upright, and so the blood ran to the depending parts of the body, and the brain was left without it.

But why should a fainting fit, which, apparently, is more severe than shock, inasmuch as the brain also has ceased to act and the patient is thus rendered more deathlike, be quickly recovered from, while shock lasts for many hours? This is a question difficult to answer, inasmuch as the necessary data fail, and we are forced to fall back on hypothesis. In attempting to answer it we must remember that it is not really the heart's action which keeps up the circulation directly. It is the pressure of the blood inside the arteries forcing it on through them, and, as Goltz's experiment shows, the heart may be pulsating and yet the circulation be at a standstill. Now, the arterial tension may be lessened, (1) by the heart stopping, or (2) sending little blood into the arteries at each beat, or (3) by the arterioles dilating so as to let the blood easily out from the arteries into the veins, where it may stagnate and be useless. Another point we must remember is that it is the circulation in the brain which is the important factor in producing insensibility. In the patient who was suddenly lifted on his feet the circulation in the body was going on perfectly well; it only failed in the brain.

Now, it is very easy to bring down the blood-pressure very much by stopping the heart for a few instants, and it may take a little while before it rises to its normal condition. A second way is to dilate the arterioles, and if the arterioles be dilated at the same time that the heart is stopped, the pressure will fall with great rapidity, and, when the heart again begins to beat, it will take a much longer time to raise the pressure sufficiently to carry on the circulation than it would otherwise do. Now, when a painful impression is made on a sensory nerve, it is not unfrequently carried up to the medulla oblongata, where it is transferred to the vagus nerve, which, as you know, has the

power of stopping the heart, and by setting this nerve into action arrests the cardiac pulsations. If the arterioles should happen to be dilated, as they almost always are in a warm room, the pressure of blood in the arteries immediately sinks, the brain getting an insufficient supply ceases to act, and the patient falls down unconscious. The very fact of the head being lowered induces more blood to pass to it, and the normal condition is at once in many cases restored.

The condition of the vessels in fainting has not been ascertained, and the only observation bearing on the subject that I can find is one by John Hunter.[1] While engaged in bleeding a lady she fainted, and during the continuance of the faint he observed that the blood which flowed from the vein, instead of being dark and venous, was of a bright scarlet colour, like that of arterial blood. Now, the only condition in which we know this to take place is when the arterioles are greatly dilated, and the blood flows so quickly through them that there is no time for it to be deprived of oxygen during its passage. This is seen in the submaxillary gland during irritation of the chorda tympani nerve, and it was observed by Meyer,[2] the celebrated propounder of the doctrine of conservation of energy, in persons whom he bled in the tropics, and who had their vessels dilated in consequence of the heat; and it was also noticed by Crawford[3] in animals bled during immersion in a warm bath. It would

[1] Works of John Hunter, edited by Palmer, 1837, vol. iii. p. 91.

[2] R. Meyer, Die organische Bewegung in ihrem Zusammenhang mit dem Stoffwechsel, 1845, p. 84. Meyer's explanation of the occasional red colour of venous blood is different from the one I have given above. We both agree that the slightness of the alteration it has undergone in its passage from the arteries into the veins is due to the fact that but little oxygen has been taken from it by the tissues as it flowed through the capillaries. Meyer considers that the tissues adapt themselves to the wants of the body, and take little oxygen from the blood when the external air is warm. The oxidation which usually goes on within the body is thus diminished, the production of the heat lessened, and the temperature of the animal prevented from rising too high. This hypothesis, though very plausible, is rendered improbable by the experiments of Bernard (*Revue Scientifique*, 1871-72, pp. 133 and 182), which show that the tissues of animals which have been exposed to a high temperature absorb oxygen (after death at least) much more quickly than usual. I therefore attribute the florid colour of the blood to dilatation of the arteries and capillaries, allowing it to flow so quickly through them that the tissues have not time to abstract much oxygen, however great their avidity for it may be.

[3] Crawford, Experiments and Observations on Animal Heat, 1788, p. 308.

therefore seem that in fainting the vessels of the external parts of the body are occasionally, at least, widely dilated, and this explains the frequency with which persons faint in warm rooms and crowded churches. I am inclined then to suppose, that in fainting there is dilatation of the vessels in the *external* parts of the body, although the data on which I found my opinion are too imperfect to allow of my speaking very positively on the subject. If you examine the veins on the back of your hand in a crowded assembly, such as people often faint in, you will probably find them very full, indicating that blood is flowing rapidly into them from the arteries, and that their colour is of a lighter blue than usual, showing that the blood they contain is lighter coloured or less venous than usual. This indicates that the cutaneous arterioles are dilated, and this dilatation has doubtless a great deal to do in many instances with the reduction of the blood-pressure and the induction of syncope. As the skin is usually pallid during the fainting fit itself, we can hardly suppose that the blood is then flowing very rapidly through the cutaneous vessels. If the hypothesis I have just advanced be correct, we are thus driven to the conclusion that it is the blood-vessels of the muscles which undergo dilatation during syncope. This idea likewise receives confirmation from the observation made by Thackrah,[1] that it is in muscular men that venous blood most frequently presents a florid colour. Such of you as have seen a living muscle cut across, however, know that when it is at rest very little blood indeed flows from the divided ends of the vessels which permeate its substance, and you may be inclined to doubt the possibility of these vessels ever being able to dilate so much as to drain, as it were, the blood from the arteries into the veins and produce syncope. That they can dilate and drain the blood out of the arteries very quickly has been shown by Ludwig and Hafiz,[2] who found that when the vessels of the intestines and skin were made to contract, the blood which could no longer flow through them poured through the vessels of the muscles, and, notwithstanding the fact that these vessels were at that very time excited to contraction by irritation of their vaso-motor nerves, the blood flowed from the arteries into

[1] Thackrah, Inquiry into the Nature and Properties of the Blood, p. 85.
[2] Ludwig's Arbeiten, 1871, p. 107.

the veins, and the pressure in the arteries sunk nearly as quickly as when the cutaneous and intestinal vessels were patent. If such be the effect of the muscular arteries on the blood-pressure when they are trying to contract, what must it be when they are ready to dilate? Dilatation of the vessels alone may sometimes be sufficient of itself to lower the blood-pressure to such an extent that fainting occurs; but at other times this is combined with the depressing effect of sudden stoppage of the heart. In shock there is great dilatation of the vessels in the *interior* of the body, especially in the veins of the intestine. If this state should be associated with sudden stoppage of the heart, instant death will occur, as in the case of the labourer in the India Docks. In short, then, I consider syncope to depend chiefly on dilatation of the arterioles, especially of those near the surface, though in cases like that of Alice Bruce it may be due entirely to stoppage of the heart; while the chief factor in shock is dilatation of the abdominal veins. The longer duration of shock than of syncope is probably due to the veins recovering their contractility more slowly than the arterioles.

Having thus formed some sort of idea regarding the pathology of syncope and shock, we come to our third head, viz. the question of treatment. In syncope, our first idea is to restore the circulation to the brain, and this we do by laying the head level with the body, or perhaps, still better, as recommended by Sir Astley Cooper, on a level somewhat lower than that of the body.

The next thing is to raise the blood-pressure. Now, this is most easily done by causing the arterioles to contract. We therefore hurry a person who has fainted from the warm room to the cold air, and dash cold water on the face, in order to cause contraction of the vessels on the surface of the body. We also give draughts of cold water to cause contraction of those of the stomach. Besides this we apply ammonia or aromatic vinegar, which is strong acetic acid, to the nose. Why do we do this? Many of you know that when ammonia is applied to the nose of a rabbit it causes the heart to stop instantaneously, and one would therefore think that to hold it before a fainting person's nose was to do the very worst possible thing. But we all know that this is not the case. Some time ago a member

of this society asked me this question, and I could at that time give him no satisfactory answer. I have since made some experiments on the subject, and I find (what has indeed been already noticed by Kratschmer [1]) that when ammonia or strong acetic acid is held before the rabbit's nose, it causes contraction of the arterioles. Consequently it prevents the blood-pressure from falling quickly, even should the heart become feeble or stop, and is thus useful in preventing syncope. When the blood-pressure has already become lowered by the occurrence of syncope, contraction of the arterioles causes it to rise, and it is by causing this that acetic acid or ammonia are useful as restoratives.

In shock we have two conditions to remove. The first of these is the feebleness of the heart itself, which is due to the action of the vagus. To counteract this we apply stimulants. Now, one of the most powerful stimulants to the heart is heat. It is true that it dilates the vessels, but in shock we have nothing to fear from dilatation of the vessels near the surface of the body, where circulation is hardly going on at all, nor is it likely that it will increase the dilatation of those in the interior. We therefore pursue a plan of treatment directly the opposite of that which we employ in fainting, and apply warmth instead of cold to the surface, especially to the cardiac region, over which a hot poultice or india-rubber bottle filled with hot water should be placed. At the same time, and for a similar purpose, we give brandy and ether internally. The second and most important indication for treatment is to cause contraction of the great vessels, especially the veins in the abdominal and thoracic cavities, so that the blood, instead of stagnating uselessly in them, may be sent onwards to the heart, and thence to the rest of the body. I have already described the effect of acetic acid and ammonia held before the nose, but this is only one example of the general rule that all powerful impressions on sensory nerves cause contraction of the blood-vessels. Painful impressions made upon the skin, for example, have this effect, and Goltz has shown that pinching the toes of a frog, or irritating them by acetic acid, prevents the vessels from dilating when the abdomen is struck, or causes them to contract and propel the blood to the heart if dilatation has already taken place. If I may judge

[1] Wiener Litz. Bericht, 1870, Abt. II. lxii. p. 24.

from my own experience, persons not unfrequently take unconscious advantage of this effect of pain, and medical students occasionally prevent themselves from fainting, when witnessing an operation, by biting their lips or pinching their fingers. Its beneficial action in shock is very great, and my friend Dr. Fayrer informs me that he has succeeded in recovering a patient from a state of collapse by thrashing his feet and the calves of his legs with switches after other means had failed. Mustard plasters are often applied for a similar purpose. Sometimes the performance of an operation during shock is attended by a marked improvement in the patient's condition, and it seems to me not improbable that this is due to the stimulus thus given to the vasomotor nerves. At other times, however, the additional injury seems to produce an injurious effect either on the heart or vessels, and the patient succumbs. It is possible that the different effects of operations performed during shock may depend to some extent on the greater or less amount of irritation which is occasioned to the nerves of bones as compared with those of the soft parts; for, as we have already mentioned, injuries to bones tend to cause syncope, while irritation of other nerves, unless it be excessive, tends to prevent it by raising the blood-pressure. This, however, is a question which pertains more especially to surgeons, and with them I will leave it. I must not conclude without mentioning another valuable remedy in cases of shock, viz., digitalis. It has, I think, been conclusively proved by Dr. Adolf B. Meyer and myself,[1] that this drug possesses the power of contracting the arterioles, and I have shown [2] that it greatly strengthens the pulsations of the heart. We would therefore expect it to prove useful in shock, and experience does not disappoint our anticipations. This is well shown by a case of shock following parturition, in which it was employed by Dr. Wilks [3] some years ago. My attention was drawn to this by my friend Dr. Milner Fothergill, and I quote the following from his admirable essay on digitalis.[1] "The patient was apparently *in articulo mortis;* her limbs were cold, her body in a state of deathly clammy sweat; the face was livid, no pulse could be felt at

[1] Journal of Anatomy and Physiology, Nov. 1872, p. 134.
[2] On Digitalis. London, 1868, p. 28.
[3] *Medical Times and Gazette*, Jan. 16, 1864.

the wrist, and a mere fluttering was heard when the ear was placed over the region of the heart. Brandy and ether had been tried without any good effect, and as dissolution was imminent, it was determined to try digitalis. Half-drachm doses were given every hour: after four doses a reaction took place, and after seven doses complete recovery occurred." Such a case as this needs no comment, and a consideration of the encouraging results here obtained can hardly fail to gain for digitalis a much more extensive application in cases of shock than it has hitherto received.

[1] Digitalis: its Mode of Action and its Use. London, 1871, p. 63.

Separaat afdruk uit het Ned. Mil. Geneesk. Archief.

Notice on the essential nature of the Diabetes mellitus vulgaris.

By the most meritorious experimental researches, executed especially in the last decenniums for the purpose of investigate the true causes of the diabetes mellitus; by exact clinical observations and scrupulous examinations of the alteration of the nutrition in the diabetics a great many valuable facts, like the refracted beams of a prism, are gathered; but nevertheless we must even to day complain with Salkowski and Leube, [1]) that the disease in question is (indeed) a dark enigma. On quoting some concise citations [2]) I will however try to show, that it is possible, by reassembling some refracted beams, to gain a solid point of issue in order to suggest an in the most respects satisfying theory as to the essential nature of the common diabetes mellitus. This theory I will essay to support by own experience of the disease in question, by microscopical examens of the urine and of the excrements, further by analogies, collected from the pathological histology, the physiology of the vegetables and from the special animal parasitology, by an exposition in a few theses of the properties of the yeast-cell and finally even by own, unassuming, but exact experimental researches.

1) Die Lehre vom Harn, Berlin 1882 s. 394 2) See Appendix.

by apnoë, if they in their struggle for existence lose their power to appropriate to themselves the with the haemoglobine of the red blood-cells loosely combined oxygen. Upon an average the living plasmas and tissues, at the setting free of the oxygen from the red bloodcorpuscles, have according Schützenberger a much greater affinity to the oxygen than the yeast-cells, what explains the great difficulty for these to bud and multiply in the living body. The on the other hand very often almost unavoidably fatal consequences for the human body of the nestling down of the yeast-cells in the liver, where they not only partly prevent the deshydratation of the grape-sugar to glycogen, probably even by hastening the blood circulation, but also and especially change the liverglycogen to grapesugar, and their spreading from the liver with the circulating blood to the other parts of the body, are chiefly depending on the property of their protoplasm to act as an analytical or hydratative ferment on the liver-glycogen, arisen itself, as well, like the fat, by an analytical process, consisting in decomposition of protoplasmatic matters [1]), whereat the haemoglobine in the blood of the liver probably constitutes the mothersubstance [2]), out of which the glycogen, the urea and the colouring matters of the bile are derived [3]), as by synthesis of grapesugar. In an analogous manner we see in the vegetables, for ex. in the unripe peas [4]), the solved albuminoïd matters, resembling the cerealin of the gluten, produce the hydratation of the starch to sugar

[1]) Senator. op. cit. p. 476

[2]) von Wittich in L. Hermann's Handbuch der Physiologie. Fünfter Band. Zweiter Theil. I Lieferung. Leipzig. 1881 s. 376.

[3]) Possibly this increased annihilation of haemoglobine explains the diminution of breathed oxygen during diabetes. (von Wittich, op. cit. loc. cit.

[4]) Jules Arnould. Nouveaux éléments d'hygiène. Paris. 1882. p. 812.

and this effect cease simultaneously with the hardening of the albuminates, when the sugar is deshydrated again to starch. On the liver-glycogen the yeast-cells exercise their influence so much easier by reason of the in plenty present dissolved albuminates and their derivates, which deliver an almost unconsumable material for the production of a diastatic ferment, that is formed by means of the end-and exosmotic exchanges through the cellular membrane of the saccharomyces, simultaneously with which the solved albuminates facilitate the entering of the ferment of the yeast-cells upon the glycogen by the softening of the envelop of the glycogenous sacs.

Yet to day much obscurity prevails on the essential nature and the mode of action of the protoplasm and the brilliant corpuscles or the germs of the yeast-cells and the divergent opinions contest with each others as eagerly as at any time for to gain the superiority. During such circumstances I will, in order to support my theory, only allege the following, by approved authorities as valid confessed scientific truths and facts.

1°. For the transsubstantiation [1]) of the starch and of the canesugar into grapesugar within the vegetable and the animal organism, the active substance is a soluble ferment that is secreted from the yeast-cell and identic with that, which is present in the small guts of the animals, where it plays an analogous part.

2°. The pancreatic diastasis [2]) possesses the faculty to metamorphose to sugar and to dextrin as much as forty thousand times of her own weight of starch.

[1]) W. Roberts. Les ferments digestifs in Revue internationale des sciences biologiques par I. L. de Lanessan. Paris 15 Août 1881. p. 92.

[2]) Roberts op. cit. p. 109.

3°. The figured ferments [1]) have a higher organisation and operate according the agreeing opinion of all more speedily and regularly than the formless. Consequently: For to convert 40 gm starch to sugar rather less than 0,001 grm of yeast-cells is sufficient, for to change 50 grm starch less than 0,00125 grm of yeast-cells is enough and so on.

4°. It is only the not growing yeast-cell, which effects fermentation (?) [2]), that is the consequence [3]) of the life of the yeast-cells without free oxygen, because the yeast-cells are active ferments only at the deficiency of free oxygen and on obtaining [4]) as azotic nourishment albuminoïd matters, that is to say the products of metamorphosis and desintegration of these last mentioned, in as much the easily soluble and diffusible derivates of the albuminates, for ex. the peptones, diastasis and syatonin, finally even allantoïn, urea, uric acid and guanin constitute perfectly appropriated aliments for the yeast-cells.

5°. Sometimes repeated access of free oxygen [5]) is in some measure a capital condition for the renoval of the life of the yeast-cell, which else dies.

6°. The fermentation [6]) represents in no wise a simple process of vegetation and alimentation of the yeast-cell, but she can under some circumstances show the opposite state of things, viz. form much yeast and hydratate little glycogen or form little yeast and hydratate much glycogen.

7°. If [7]) we to a mixture of yeast, water and common

[1]) Léon Marchand. Botanique cryptogamique. Les ferments. 1883 p. 365.
[2]) A. Hiller. Die Lehre von der Fäulniss. Berlin. 1879. s. 391.
[3]) Hiller op cit. p. 395
[4]) Hiller op. cit. p. 397.
[5]) Hiller op. cit. p. 406.
[6]) Hiller op cit. pp. 428-429.
[7]) Graham. La chimie de la panification in Lanessan. Revue. 15 Décembre 1881. p. 530.

starch, which is unboiled and its cells consequently unhurt, add a verry little of an infusion of any corn, it may be whosoever, prepared with cold water, we will find, that the in this infusion soluble albuminoïds undergo the action of the yeast and are decomposed from their complicate molecular structure to the condition of a less complexed molecule. With other words: they are less colloïd and gummous; they are more instable. This particular molecular modification is the result of the influence, exerted upon them by the yeast; so altered these albuminoïds gain the faculty to penetrate the wall of the starch-cell and thereby to effect the hydratation of the starch. The sugar is produced by the intervention of the in the wheaten meal contained soluble albuminoïds. From this one is authorised to infer, that the yeast-cell alone is impotent to penetrate as far as to the starch in the cell and that the by the yeast produced effect is only indirect. This action consists above all in the change of the form of the soluble albuminoïds and ultimately to let these penetrate through the walls of the starch-cell.

8°. If we inquire, why the sugar in the blood proceeds not further in fermentation, viz. to alcohol, Thudichum [8]) answers: Because the blood-serum shows alkaline reaction. The yeast himself is always acid. [9])

9°. The most favorable temperature [10]) for the fermentative process is + 25°C. to + 30°C., but according. Marchand [11]) the temperature, at which the most protoplasms unfold their maximum of activity, varies between +35°C. to +40°C.

[8]) Thudichum. Pathology of the urine. London. 1877. s. 428.
[9]) Schützenberger. Les fermentations. Paris. 1879. s. 134.
[10]) Hétet. Manuel de chimie organ. él. Paris. 1880. p. 656.
[11]) Marchand, op. cit. p. 407.

10°. Saccharomyces dies not away [1]) at—113° C., nor at +130° C.

11°. According Ehrenberg [2]) a single microb can produce one million of the same sort in a day and in four days 140 billions, that represents almost two cubic inches.

12°. The yeast-cells [3]) destroy the best aliments and products arise, that contain a smaller quantity of potential energy. The yeast-cells possess in the same time a synthetical and an analytical faculty. In the former case they compose the for their nutrition proper proteïnic matters of sugar and ammoniac; in the later case they influence the soluble albuminoïds to form a less complicated molecule.

13°. The large group of ferments [4]) consists of destroying, consuming cryptogames, which effect combustion by respiration of oxygen. Whereas they are deprived of chlorophyll and can not produce organic matter for to live, they are forced to live on the cost of them, which produce hydrates of carbon; every where they find this combination, they appropriate it to themselves — — — make the host to fall sick, devour him by little and little and turn him into their own substance.

14°. As an evidence [5]) that the in the next foregoing paragraph exposed thesis possesses validity and application even on the Saccharomyces, I will quote the following example as an analogy from the animal kingdom.

The Sacculina, the parasite of the crab, is in her turn attacked by a parasitic disease, that effects her atrophy and definetely her complete destruction. S. Jourdain has

[1]) Marchand. p. 407.
[2]) Marchand. p. 16.
[3]) Langer. Physiologie. Berlin 1881. s. 64.
[4]) Marchand pp. 19, 96, 114.
[5]) De Lanessan. Revue. 15 juillet 1881. pp. 82—83.

sometimes hit on these Sacculinae in the last stadia of pathological regression, measuring only 0,002 or 0,003 m. in diameter and which were discernible from the youngs of the same complexion by the blackish furfuraceous paint, with which they were covered then. The stomatorhizae, that is the rootformed prolongations, which proceed from the anterior pole of the genital sack of the Sacculina Carcini, appear to be filled up by a Saccharomyces, which is sharply defined from the Mycoderma vini and the Saccharomyces cerevisiae, with which S. Jourdain has compared him. He buds and multiplies himself as the Saccharomyces. Beyond, every one of the poles, which correspond with the largest axis of the cell, can emit a myceliumshaped prolongation, that S. J. has succeeded to follow in her evolutive cycle. All the cryptogamic cells, that S. J. has cultivated in the humid chambre in the midst of a saccharine fluid, have emitted without exception this double prolongation, whose evolution for to be performed requires possibly a change of the medium. Often these yeast-cells have appeared associated with psorosperms of variable dimensions.

From these general and special considerations we are naturally led to answer the question concerning the occurrence of the Saccharomyces minor and ellipsoideus in the common substrates of material life. Microscopical examinations have brought to light, that these are to find in the drink-water in Sweden in sundry places, where diabetes is observed sporadically, together with greater or smaller colonies of extra ordinarily subtle bacillums, whose diameter is 0,5 mm. and the length of each individual varies from 2 to 3,4,5, mm. and more. They are articulated and hang together in long rows. If it is to the action of this microb, that we must impute the production of aceton in diabetes or if he together

with the saccharomyces-cells contributes to hasten the decomposition of the albuminoïd matters in the diabetics, is impossible to determine to day. The local essential conditions are of course in some measure all the same as those, which produce some other infectious diseases, as for ex. the ague, the scarlet and so on. The relative rareness of the diabetes in comparison with the last mentioned epidemical diseases might have her true explication in the great difficulties even for the growing yeast-cell to penetrate the normal mucous membrane of the stomach and of the intestines. In the cases, in which none saccharomyces-cell can be detected (by accident) in the fresh urine, the protoplasmatic corpuscles (=the brilliant germs) of these may be observed, surrounded by a little protoplasm. During favorable circumstances, i. e. the presence of urea, oxygen and sugar, the protoplasm is augmented and the germs are enveloped with a membrane of cellulosa.

The „personal faults" play a particularly important part for the production of diabetes. The principal and most frequent are errors in the diet, as immoderate eating of amylaceous foods or saccharine fruits, with following disorders of the digestion and a faulty composition of the blood and of the other humours of the human body by the wrong direction of the whole nutrition and assimilation; abuse of spirits, by which the human organism is converted in an acid dough, where the yeast-cell acts almost the same disastrous part as the spark of fire in the powder-room; further, want of bodily exercise, profoundly agitating emotions of the mind, and so on. In the very same places, where, as for ex. in Ceylon and Thüringerwald, the local essential and the predisposing personal influences are more often combined, that is to say, where the inhabitants make an immoderate use of saccharine fruits, whose surface is covered with energetic yeast-cells (Saccharomyces apiculatus), diabetes is more frequent.

It is well known, that the inuline of the artichokes of Jerusalem approaches to the glycogen on the nearest of all amylaceous matters. At the digestion of thin shives of such artichokes at a temperature of + 37° C. together with yeast-cells their standard of sugar is considerably augmented in a few minutes. Under the same conditions the on glycogen rich liver of fresh oysters shows manifest reaction on grape-sugar.

The mild cases of diabetes are healed by means of an exclusively animal diet, much bodily exercise, alkalies, hydrotherapy and sol. iodi spir., ten minims in sugar-water, thrice to four times every day. The severe cases are all incurable, although we know, that phosphor and arsenic annul the function of the liver to produce glycogen, and iodine and also many other physics (without the living organism) annihilate the fermentative faculty of the protoplasm of the yeast-cells.

2) *Appendix, containing the to day most remarkable theories on the nature of Diabetes mellitus.*

1°. The essential cause of diabetes is according Funke [1]) the exceeding accumulation of grape-sugar in the blood; this accumulation herself again can arise on different manners. A. She may be produced directly by injection of solutions of sugar in the blood. B. She arises spontaneously in men during for the present unknown pathological conditions. C. She appears as consequence of some lesions of the nervous system. D. As effect of the influence of some poisons on the nervous system. Lesion of the medulla oblongata on a fixed spot at the bottom of the fourth

[1]) Otto Funke's Lehrbuch der Physiologie. Leipzig 1876. I Theil. s. 153

or from starch derived sugar arrives into the liver. From this organ it is transported in the circulation without to have been metamorphosied into glycogen, but moreover the from sugar or other matters formed glycogen is transformed again more speedily and in more considerable quantities into sugar, that is carried away. C. The cause is a diminution of the power to burn the sugar, which is introduced in the general circulation.

9o. Zimmer [1]) directs the attention on the fact, that hitherto at the interpretation of the origine of diabetes one has not concerned the muscles, where glycogen and sugar are formed, and nevertheless the muscle in repose stores, as we know, like the liver hydrates of carbon in the form of glycogen in its tissue; during labour this glycogen is converted into sugar, that is further decomposed in sarcolactic acid and finally in carbonic acid and water. That the muscle during his activity destroys even in the blood circulating sugar is most evident from the cures, that are effected on many diabetics by means of methodically used bodily exercises.

10o. Cantani [2]) says, that the diabetes mellitus is a disease of the nutrition, in which, without that an abnormous production of sugar is found, this is not consumed as fewel in the organism. This resistance, that the sugar in diabetes shows against the process of oxydation, may proceed therefrom, that the ferment, which disintegrates the sugar, either is totally absent or operates in abnormous manner on the sugar and metamorphoses it in a combination, on which the oxydising forces of the organism are wholly impotent. According Cantani the blood-sugar — the paraglycose — of the diabetes is different from the

[1]) Loebisch. op. cit. p. 273.
[2]) Loebisch. op. cit. loc. cit.

normal blood-sugar. As material residence of the diabetes Cantani admits in the first stage the pancreas, even the digestive glandules of the stomach and intestines; it is only indirectly, that affections of the central nervous system, on influencing upon the chylopoëtic organs, effect diabetes.

Stockholm, 8 Skeppsholm,
the 19 March 1883.

Dr. Fr. EKLUND.

THE

THERAPEUTICS OF BELLADONNA

IN

INTESTINAL OBSTRUCTION.

BY

ALEX. THOM, JUN., M.A., M.B., & C.M.,

CRIEFF.

Read before the Perthshire Medical Association, 3d October 1879.

EDINBURGH: OLIVER AND BOYD, TWEEDDALE COURT.

MDCCCLXXX.

REPRINTED FROM THE EDINBURGH MEDICAL JOURNAL FOR DECEMBER 1879.

THERAPEUTICS OF BELLADONNA.

THE following case of intestinal obstruction treated by belladonna, and similar in some respects to others already published (Brit. Med. Jour., etc.), is interesting, both on account of the age of the patient and as broaching the question whether the full therapeutic action of the drug may not be materially hastened by the use of mild aperients after its physiological action has been established. In Dr Tuckwell's case (Brit. Med. Jour., Nov. 23, 1878) four days elapsed between the manifestation of the physiological phenomena and the desired therapeutic effect. In others a similar and even longer period has elapsed.

M. C., 73, a thin frail old woman in feeble health for some years, had suffered from constipation for several days, and in the forenoon of 22d September 1878 began to experience pain in the abdomen, which increased in severity towards evening, when she took a dose of castor-oil. This was not retained. During the night the pain became very intense, and accompanied by retching and vomiting. Hot fomentations and poultices were applied; but not having experienced any relief, she sent for medical assistance.

23*d*, Face anxious. Pulse about 100. Tongue dry and coated. Complains of great pain in abdomen, especially towards right side. On inspection, abdomen is prominent. Great pain is caused even by light palpation. A tumour can be felt in the right iliac region about 3½ inches long and 1½ or 2 inches broad, its long axis corresponding to that of the body. It is hard, and cannot be removed by manipulation, which increases the pain. The injection of warm water *per rectum* brought away a quantity of well-formed fæcal matter, natural in appearence and colour, but had no effect on the tumour, and the pain remained the same. She cannot take any food, feels sick, and is much troubled by retching. Forty minims of liq. morphi. hydrochlor., repeated in 1½ hours, procured a few hours' restless sleep and temporary relief from pain.

Vespere, The tumour and swelling of abdomen remain the same, and there is still great pain, increased on movement or when touched. An ounce of castor-oil was ordered to be given should

the vomiting not return. Fomentations continued. Forty minims of liq. morph. hydrochlor. at bed-time.

24*th*, Patient weaker; pulse 100, small; skin hot and dry. Slept none. Vomited the castor-oil, and on two successive occasions a considerable quantity of semifluid matter having a fœcal smell and character. Pain intense. Enemata were tried, but only about half a pint can be retained, and that only for an instant. Tumour in abdomen in same condition as yesterday, but more tender to the touch, and abdomen more swelled and tympanitic. Ordered one grain of extract of belladonna in pill every hour.

25*th*, Nine pills have been taken. After the sixth her mind began to wander; she became drowsy, and occasionally dropped off into a restless sleep. She has had the last three pills at intervals of two and three hours. Face flushed, has been somewhat delirious all night, and is now talking incoherently. Pulse about 120, weak. Micturition frequent. Mouth very dry, no vomiting, and no pain except when touched. Tympanitic distension of abdomen less, but no change in the abdominal tumour. Pupils dilated. The physiological action of the belladonna (and also its therapeutic action as far as pain is concerned) having been established, it is discontinued. Ordered milk, beef-tea, and lemonade made from the fresh lemon. Two pills, each containing $\frac{1}{3}$ gr. of podophyllin, at noon, to be followed by magnesiae carbonatis ʒss., magnes. sulph. ʒss., aquae cinnamomi ℥j. in the evening.

26*th*, Bowels moved freely twice, the first time about ten hours after the administration of the podophyllin, and less than two hours after the saline draught. Tumour gone. Abdomen natural size. No pain, only tenderness on pressure. The motions consisted of large masses of hardened fœces, varying in colour from very dark olive green to light yellow, and a considerable quantity of fluid and semifluid matter.

She made a fair recovery, considering her age and feeble condition.

Remarks.—Possibly in such cases belladonna proves serviceable rather by producing physico-vital changes in the walls of the intestinal canal, than by increasing the secretions which act chemically and mechanically on the contents; we know, besides, that stimulation of the sympathetic fibres which supply the salivary glands causes the secretion of a viscid saliva, small in quantity; and as belladonna is held to stimulate the vaso-motors, I do not think, in the present state of our knowledge, it is too much to assume that, if it increases the intestinal secretion at all, that secretion has a viscid rather than a watery character. If this be true, such medicines as will tend to supply the proper secretions are clearly indicated.

Smokers hold that a pipe of tobacco after breakfast is a pleasant but efficient means of procuring easy movement of the bowels. I have no doubt that here there is directly through the nervous system a reflex action on the muscular fibres of the intestines.

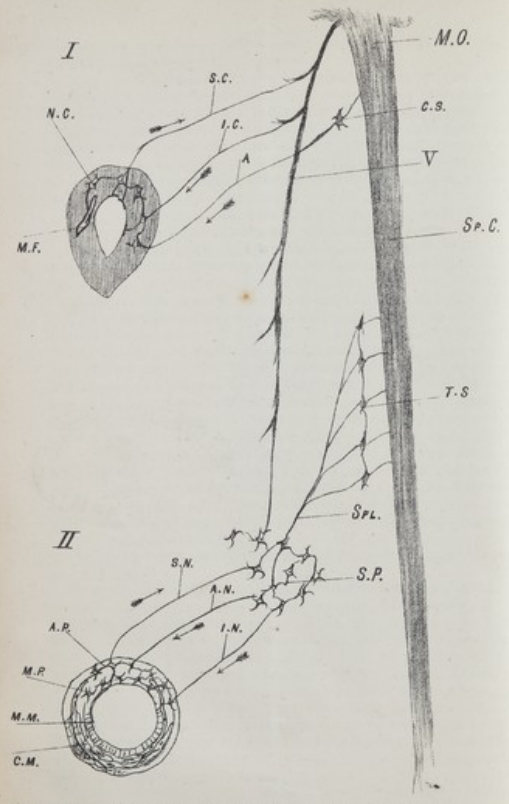

Diagram to illustrate the Innervation of the Heart (I.) and Small Intestines (II.) (After Rutherford.)

M. O., Medulla oblongata. *Sp. C.*, Spinal cord. *V.*, Vagus nerve. *N. C.*, Intracardiac nerve cells. *M. F.*, Muscular fibre. *S. C.*, Superior cardiac. *I. C.*, Inferior cardiac branch of vagus. *C. S.*, Cervical sympathetic ganglion. *A.*, Accelerating nerve. *T. S.*, Thoracic sympathetic ganglia. *Spl.*, Splanchnic nerve. *S. P.*, Solar plexus. *S. N.*, Sensory nerve. *A. N.*, Accelerating nerve. *I. N.*, Inhibitory nerve. *A. P.*, Auerbach's plexus. *M. P.*, Meissner's plexus. *M. M.*, Mucous membrane. *C. M.*, Circular muscles.

Belladonna and tobacco belong to the same natural order, and it is to be surmised that their therapeutic as well as their physiological effects are similar. To say, however, that the action of a drug is directly through the nervous system, is a very vague way of expressing that action; in fact, it is in too many cases a cloak to hide our ignorance. When we are asked what part of the nervous system is affected, which nerves are paralysed and which stimulated, whether the nerves are acted on directly and reflexly or from the nerve-centres through the blood, the answer is by no means easy to find, and indeed in many cases impossible, for our knowledge of therapeutics is still deplorably behindhand.

Let me remind you shortly of the innervation of one or two of the so-called involuntary muscles of the body, and let us notice first the arrangement of the nervous supply to the heart, not because it is perhaps the simplest, but because it has been worked out with the greatest approach to certainty.

We know of four different sets of nerves which are concerned in maintaining and promoting or controlling the functions of the heart:—1*st*, The intra-cardiac ganglia; 2*d*, The superior branch of the vagus; 3*d*, The inferior branch of the vagus; and 4*th*, The cardiac branch of the sympathetic. (These are diagrammatically represented in this rough sketch after Rutherford.) To the intra-cardiac centres is due the automatic action of the heart. The cells which they contain have an efferent nerve-fibre from the endocardium, and an efferent one to the muscular fibres, and are continually evolving energy. This, when it has gained a certain tension, is liberated, and causes muscular contraction. The rapidity with which this energy is produced may be accelerated by stimulation of the afferent nerve from the endocardium, and by other nerves and agencies. The superior cardiac branch of the vagus is sensory to the heart, and is also excito-cardio-inhibitory. The inferior cardiac branch is the inhibitory or controlling nerve, and its fibres pass into the nerve-cells in the substance of the heart. If this nerve be divided the heart beats faster, and stimulation of the lower-cut end causes slowing of the heart, the evolution of energy in the cells being inhibited. Belladonna causes increased action of the heart by paralysing this nerve. The sympathetic branch is the accelerating nerve, and its action is therefore directly opposed to the last mentioned.

A similar mechanism is found in connexion with the intestines, but its several portions cannot be so well defined. The vagi and splanchnics unite in forming the solar plexus, from which nerve fibres pass to all parts of the small intestines, breaking up in their walls into smaller gangliated plexuses called Auerbach's and Meissner's plexuses. These plexuses, containing nucleated nerve cells, are analogous to the intracardiac ganglia, but the muscular action over which they preside is not automatic. Each cell possesses an afferent or sensory nerve fibre from the inner surface of the

gut, and an efferent one which may be either motor (*i.e.*, to a muscle fibre) or secretory (*i.e.*, to a gland). Stimulation of the afferent fibre by means of food causes the evolution of nerve energy by the nerve cell, and consequent muscular contraction or glandular secretion or both. To these cells, then, is primarily due the peristaltic action of the intestines, and as that is produced by the combined action of the circular and longitudinal muscular fibres, probably separate groups of nerve cells preside over each. Mild stimulation of the vagi and splanchnics gives rise to peristaltic action, probably by accelerating the evolution of the energy in the nerve cells. Strong stimulation of the splanchnics inhibits that action. But the splanchnics are also the vaso-motor nerves to the intestines, and stimulation of them decreases the size of the blood-vessels, but increases the quantity of blood passing through them. The splanchnics thus seem to be both accelerating and inhibitory, and on them in all probability the belladonna exercises most influence, either reflexly or by direct stimulation of their centres through the medium of the blood. Section or paralysis of the nerves from the solar plexus to the intestines increases the secretion of intestinal juice.

In the ordinary course of digestion, the presence of food in the small intestine gives rise to stimulation of the afferent nerves proceeding to Auerbach's and Meissner's plexuses, whereby nervous energy is there evolved, and peristaltic action takes place. Thus the food is passed on lubricated by secretion, which flows in obedience to the same nervous stimulus. But also the presence of food in other parts of the intestinal canal (stomach, for instance), and various other stimuli acting through afferent or sensory nerves passing to the medulla oblongata and spinal cord, bring about, reflexly through the solar plexus, peristaltic action. By this is explained the tendency to peristalsis in the lower part of the gut which follows the entrance of food into the stomach.

The theory which I at present hold with regard to the action of belladonna on the intestines in cases of obstruction is as follows:—When from some reason or other a portion of the contents of the gut has been delayed in its passage along the canal, its very presence stimulates the afferent nerves to the intramural ganglia, whereby peristaltic action is set up. From its shape or other physical character this peristaltic action may not be sufficient to urge it along, and soon the afferent fibres to the solar plexus and more distant nerve centres are also stimulated, whereby reflexly increased peristalsis is brought about. It is while this rapid peristalsis is going on that I imagine invagination most likely to occur, for it is not difficult to understand how easily a tightly contracted ring of intestine may slip under an immediately adjacent ring in a state of relaxation, and be grasped by the latter when it in turn contracts. Even this increased action may be insufficient to remove the offending mass; and if so, it is grasped tighter and

tighter as it gives rise to more and more irritation of the afferent nerves, until at last there is no longer peristalsis, but strong spasmodic muscular contraction. Secretion too, which might lubricate the surface, is put a stop to. At this stage, or even before it, belladonna may be helpful, and how? Well, the stimulation of the splanchnics, which is at first somewhat slight, causes increased peristalsis, the belladonna acting probably through the fibres derived from the spinal cord. We also get through the sympathetic nerves contraction of the bloodvessels, which of itself causes some intestinal movement. If the obstruction be slight, this increased peristalsis may be sufficient to overcome it; should it not do so, a continuance of the drug brings about a further stimulation of the splanchnics (and more particularly their sympathetic fibres), with possibly paralysis of some accelerating fibres. The result of this stimulation is inhibition of the energy evolved by the ganglionic cells, so that the muscular fibres, and more particularly the circular ones, no longer stimulated to contract to their utmost, gradually relax their hold, and the contained mass is no longer rigidly held as in a vice. Now the walls and the contents have some chance of accommodating themselves to one another, and an invagination has an opportunity of being released; the flatus, too, which has accumulated above the obstruction, finds its way downwards, and as the inhibitory action passes off, perhaps the returning natural peristalsis may be sufficient to remove the contents. Frequently, however, a long time elapses before that occurs; and it is not to be wondered at, for as section of the intestinal nerves increases the secretion, stimulation must decrease it; and so, partly due to the belladonna, and partly to the pathological condition, that secretion is wanting which might lubricate the contents, and otherwise so transform them that they might be the more easily passed onwards. At this stage, I think, such aperients as are known to cause a somewhat watery secretion, and at the same time mild intestinal stimulation, will be found valuable.

In cases of spasmodic asthma, the action of stramonium, another plant of the same natural order, is to be explained in a similar way to that of belladonna here. Some irritation, central or peripheral (and if the latter, reflexly), causes stimulation of the nerves supplying the bronchial muscles, whereby strong contraction takes place. The stramonium so acts on the peripheral end-organs of afferent nerves in the lungs that they in turn stimulate the inhibitory nerves. These again retard or stop the evolution of nerve energy in the nerve cells, and so the muscles, freed from their stimulation, regain their normal tone, and the bronchi their natural calibre.

EDINBURGH: PRINTED BY OLIVER AND BOYD.

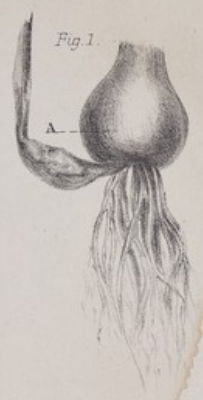

Fig. 1.

June

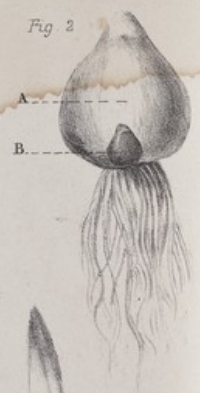

Fig. 2.

July

Fig. 3.

September

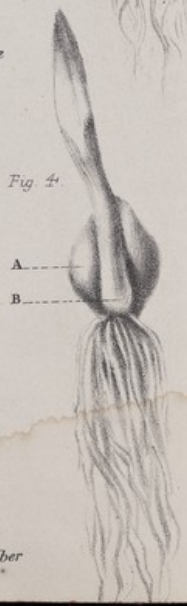

Fig. 4.

February

Dr J. Mc GRIGOR MACLAGAN ON COLCHICUM

Fig. 5.

April

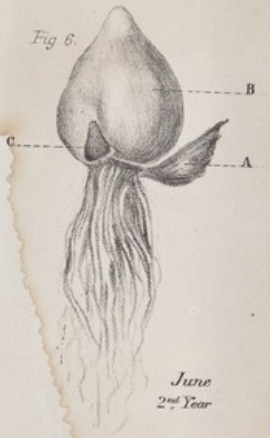

Fig. 6.

June
2nd Year

Fig. 7.

May
3rd Year

Fig. 8.

July
3rd Year

ON THE

NATURAL HISTORY, PHYSIOLOGICAL ACTIONS,

AND

THERAPEUTIC USES,

OF

COLCHICUM AUTUMNALE,

CHIEFLY WITH

REFERENCE TO THE GROWTH OF THE PLANT, AND
THE CHEMICAL CHANGES IT PRODUCES
ON THE BLOOD AND URINE.

BY

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SOCIETIES OF EDINBURGH.

EDINBURGH:
SUTHERLAND AND KNOX, GEORGE STREET.

MDCCCLII.

[FROM THE MONTHLY JOURNAL OF MEDICAL SCIENCE, FOR 1851-52.]

MURRAY AND GIBB, PRINTERS, EDINBURGH.

With the Author's Compl.

ON COLCHICUM AUTUMNALE.[1]

It appears probable that this drug is identical with that known to Dioscorides,[2] Paulus Ægineta,[3] Alexander Trallianus,[4] and other ancient authors, under the names of "Κολχικον" and "Ἑρμοδακτυλος;"[5] but it is equally probable that its use in medicine did not become established till so late a period as 1763, when it was introduced, with many other remedies, by Baron Stoërk,[5] of Vienna. Subsequently it has been examined with much attention by Sir Everard Home,[6] Sir Charles Scudamore,[7] Dr Haden,[8] and Mr Want.[9]

In the following inquiry, I propose to direct attention,—first, to the botanical and chemical histories of the drug, chiefly with reference to the growth and preservation of the bulb, and to the nature of the active principle obtained from it; and secondly, to its physiological and therapeutic actions.

BOTANICAL HISTORY.

Colchicum belongs to the endogenous natural order *Melanthaceæ* of Lindley, and *Colchicaceæ* of De Candolle, of which order the following are the principal distinguishing characters:—

They are in general bulbous, or fibrous-rooted plants. In some the flowers are half-subterranean, like the *Crocus*; in others they

[1] Being an abstract of an Inaugural Dissertation, delivered to the Medical Faculty of the University of Edinburgh, August 1851.
[2] Dioscorides—Materia Medica, lib. iv., cc. 84, 85.
[3] Paulus—Materia Medica, lib. vii., c. 3.
[4] Alexander—Medici Libri, lib. xi.
[5] Stoërk de Colchico, 1763.
[6] Sir E. Home—Philosoph. Transac., 1816-17, part 2.
[7] Sir C. Scudamore on Gout and Rheumatism, 1819.
[8] Haden on Colchicum, 1820.
[9] Want—Lond. Med. and Phys. Jour., vol. xxxii.

form spikes, or simple branching herbaceous stems, as in the genus *Veratrum*. The Calyx and Corolla form together a perianth, generally consisting of six pieces, which are usually petaloid. The ovary is three-celled, with many seeds.

They belong to Linnæus' class and order *Hexandria Trigynia*. The *Melanthaceæ* approach in character most nearly to the *Liliaceæ*, but are distinguished from that order by their tripartite fruit, and anthers turned outwards.

These plants are common at the Cape of Good Hope, Asia, and North America.

"This order seems to be confined within no geographical limits; it is, however, far more abundant in northern countries than elsewhere."[1]

In their properties, these plants are almost always poisonous in all their parts, and act generally as *narcotico-acrids*.

The principal genera of this order which furnish medicinal plants, and whose active properties have been most fully investigated, are COLCHICUM, VERATRUM, and ASAGRAEA, to the former of which, however, our attention is at present limited.

There are three well-known and distinctly-defined species of COLCHICUM,—namely, *Colchicum autumnale*, *C. montanum*, and *C. variegatum*.

Colchicum Illyricum has been supposed by some to be a distinct species, but more generally it is considered to be identical with *C. variegatum*. To this species the drug known as HERMODACTYL has been referred.

Kunth[2] believes that the *Colchicum montanum* of Allioni and the *C. autumnale* χ of Bertolini are identical. He thus describes this species:—The tube of the perigone is five or six times longer than the limb; the calycine segments lanceolate; stamens equally inserted; bulb unifloral; leaves succeeding the flowers, linear lanceolate, obtuse, and attenuated towards their base. *C. variegatum* he regards as a distinct species, and thus describes it:—Leaves oblongo-lanceolate, channelled, and undulated at their margin; the lanceolate segments of the corolla acute.

COLCHICUM AUTUMNALE is the only species officinal in this country. In vernacular language it is termed *Autumn Crocus*, or *Meadow Saffron*. It is indigenous to Britain, occurring frequently in Suffolk, Oxfordshire, and Wiltshire, in England; but in Scotland, although found in many situations, it must be regarded rather as an introduced than a native plant, the only Scotch station assigned to it being at Alloa.[3]

The leaves of COLCHICUM are broad, lanceolate, and erect.

[1] Lindley's Vegetable Kingdom.
[2] Kunth—Enumeratio Plantarum, tome iv., 1843.
[3] Lightfoot—Flora Scotica.

The flowers arise from the bulb by a long tube, which is surrounded at the base by a membranous sheath.

The stamens are inserted in the oblongo-ovate segments of the pale purple perianth.

The ovary is at the base of the bulb, and its long filiform style runs up the whole length of the tube.

In its mode of inflorescence, COLCHICUM AUTUMNALE somewhat resembles *Tussilago Farfara*, or common *Colt's-foot*, inasmuch as the flowers and leaves occur at different seasons,—the difference being, that in the *Colt's-foot* the leaves immediately succeed the flowers, whilst in the COLCHICUM several months elapse between the flowering and leaf-bearing seasons.

The manner of the propagation of COLCHICUM AUTUMNALE is interesting, not merely in a botanical point of view, but also as regards the medicinal qualities of the corm or bulb at different periods of its growth.

It is well known to be capable of being propagated in two different ways,—namely, by seeds and bulbs. Dr Christison,[1] however, has mentioned a third,—viz., the throwing off of a number of small immature bulbs from the parent plant. The manner in which perfect plants grow from seeds and immature bulbs has not been determined. It has not, indeed, been accurately ascertained if these immature bulbs ever produced perfect plants at all; but it seems probable that their immature separation from the parent renders them incapable of coming to perfection, and they are perhaps to be regarded more as a kind of abortion, than as the fruits of a legitimate mode of propagation.

I have endeavoured to trace the growth of the plant from seeds, but in vain. The COLCHICUM in Scotland rarely produces fruit, and never ripens its seeds. I have never succeeded in attempts to grow any of the seeds procured from the druggists' shops.

The propagation of the plant, by its more ordinary method of forming a single new bulb, has been better ascertained; and, in order to enable the growth of a single bulb to be traced from its origin to its termination, I shall in my description refer to the accompanying diagram,[2] where the individual bulbs are lettered, and can be easily followed through all the stages of their progress.

We shall suppose the time at which the observation is commenced to be *June*, and that we have in view a nearly full-sized bulb, which we shall call A. At this time it is as large as an apricot, firm, amylaceous, and extremely bitter, and having attached to it the shrivelled remains of the old bulb, and the leaves, now yellow and decayed.

At the end of *June*, or commencement of *July*, a small bulb will be observed to have become developed upon the side of the corm

[1] Dispensatory.
[2] The figures in the diagram are reduced one-third.

A, at its lower part. This small bulb we shall call B. At this time it is a little larger than a grain of wheat, and lies in a small fissure on the side of the parent bulb, a little above the origin of the radicles. It increases slowly and gradually in size till the beginning of *August*, when it appears as a mere dilatation of the flower-stalk, which it then commences to put up.

In *September* the flower is in full perfection, the long tube of the perianth of which, has raised the six-partite limb to the height of from six to eight inches above the ground. The flower remains for two or three weeks, and then dies down; and nothing of the plant is seen above the surface till the beginning of *February*, when the leaf-stalk commences to rise.

If at this time the plant be taken up, A and B will still be found to be united, but B will be observed to have increased little in size since autumn, being but still hardly larger in diameter than the leaf-stalk.

The bulb B thus grows little during the autumn, but in winter it increases rapidly in size; in *April* it is like a large hazel-nut, and from that time it increases still more, till the end of *June* or beginning of *July*, when it is, as Dr Christison states, as large as an apricot.

In *April* the leaf-stalk is found perfected by a fine group of dark green leaves, generally three in number, and having within their sheath the capsules which ought to ripen their fruit in the course of summer.

In *May* the old bulb will be found dry and withered, and with very little starch; and in *July*, if the plant be taken up, three bulbs will be found,—A, now reduced to the form of a membrane, bearing no resemblance to a bulb at all; B, now arrived at full growth; and a new member of the series, C, the progeny of B.

This third bulb, C, it is unnecessary for us to trace further; it follows a course precisely similar to that through which B has passed, and which has just been described.

The history is now complete, so far as regards the rotation of flowers, leaves, and fruits; but the lifetime of B has not yet expired; for if we take up the plant in *May* of the third year, we still find the shrivelled remains of B, and C large, firm, and amylaceous, now bearing leaves, having flowered during the previous autumn. We may go on still further, and if in *July* the plant be examined, B will be found to have almost disappeared, C large, amylaceous, and extremely bitter, and at its base a new bulb D, of very minute size, which in the ensuing autumn will produce the flower.

Thus we have traced the growth of COLCHICUM from its infancy, through maturity, to decay.

It must be evident, from the foregoing observations, that the plant is essentially biennial, but it has been thought by some to be triennial. "It sees a part of three successive years, but only outlives two revolutions of each season." (Christison.)

Of peculiarities in the growth of COLCHICUM, I may mention one, which has struck me forcibly on account of its frequent occurrence.

In *February* and *August*, instead of one leaf-stalk and one flower-stalk making their appearance at their respective periods, I have often remarked that two have occurred, one on either side of the parent bulb. I believe this to be one of the effects of cultivation, as I have nowhere seen it remarked in descriptions of the plant by botanical authors.

Having observed, in cases where the leaf-stalk was accidentally removed from the parent bulb, that a new bulb was thrown out from the top part of the old one, I made the following experiment, in order to ascertain, if possible, the cause of this peculiarity.

Two bulbs were taken up on 1st *November*; from these the leaf-stalks and their bulbs were detached, and the parent bulbs replanted. Three weeks afterwards a small leaf-stalk was observed to have been given off from the top part of each bulb; and on another occasion, on which the same experiment was tried, two of these leaf-stalks made their appearance. In both of these instances they were found to proceed from very minute bulbs, not larger than barley-corns.

I believe that there is always one of these adventitious bulbs at the top of each parent bulb, but that they never germinate, where the plants are indigenous, unless the proper leaf-stalk and its bulb be removed. When they do so, however, they always remain attached to the parent bulb, and are perfected in much the same time as the normal bulb of the leaf-stalk.

Dr Christison has mentioned that the full size of a COLCHICUM bulb is that of a small apricot. This I believe to be perfectly correct, in places where the plants are indigenous; but I have frequently procured specimens from the Botanic Garden here, where they were cultivated for the purpose of examination, of the size of large apples; and in *October* 1849, I procured one which weighed nine and a half ounces.

I have lately received from the North-Western Provinces of India two specimens of COLCHICUM bulbs, which respectively bear the names of "SORINJAN TULK," or bitter *Sorinjan*, and "SORINJAN SHEERUN," or sweet *Sorinjan*. Both of these were brought from Bombay, and I believe are identical with those mentioned by Dr Royle,[1] and thus described by Dr Pereira:—"The SORINJAN SHEERUN resembles the cormus of colchicum autumnale. The cormi are flattened, cordate, hollowed or grooved on one side, convex on the other; they have been deprived of their coats, are externally dirty-yellow or brownish, internally white, easily broken, farinaceous, odourless, tasteless, or nearly so, and worm-eaten."[2]

[1] Royle's Materia Medica. [2] Pereira's Materia Medica.

This description entirely coincides with the specimens in my possession. They are so easily broken, that when I received them nearly one-half was reduced to powder.

Geoffroy[1] has correctly pointed out how they may be distinguished from the cormi of COLCHICUM AUTUMNALE. "They are not rugose, are white intenrally, are moderately hard, easily broken, and form a whitish powder; whereas the dried cormi of COLCHICUM AUTUMNALE are rugose, softer, and have a reddish or grayish tint, both internally and externally."

The SORINJAN TULK appears to me to resemble the bulb of COLCHICUM *variegatum*; they are much smaller than the preceding, and possess considerable bitterness; they are not so easily broken. Pereira states that they are marked by longitudinal stripes, indicating a laminated structure. I have failed to discover this in the specimens in my possession; and I presume if the true HERMODACTYL possesses a laminated structure, it cannot be considered as a true cormus, and therefore cannot belong to the colchicum tribe. The Hakeims use both kinds in *rheumatism*, and in many nervous disorders, in doses of two to four grains of the powder three times daily.

I also received from the same source a few seeds, which were said to be those of COLCHICUM *Illyricum*. They were of the size of, and altogether not unlike, *Lupin* seeds. I attempted to grow them, but in vain. They are used in the same diseases as the SORINJAN, and are said to be diuretic.

PHARMACOLOGY.

Every part of the plant, excepting the leaves, has been used in medicine. The flowers have been used galenically, and have been supposed to be that part of the plant used in the preparation of the *Eau médicinale d'Husson*. In most modern pharmacopœias, as in those of the British Empire and of France, the seeds and corms alone are officinal.

As found in commerce, the seeds of COLCHICUM are rough, small, and almost spherical, imparting to the mouth a bitterness and acrimony which surpasses that of the bulb. They are about the size of millet seeds, and have a dark brown colour.

The slices of the bulb are grayish-white, somewhat kidney-shaped, and have a dark-brown covering externally. When in good preservation, they are dry and easily fractured. They should not be thicker than a half-crown. Their taste is extremely bitter, and somewhat acrid.

There has been much difference of opinion as to the time of year in which the cormus should be taken up for medicinal use. According to my own observations, the middle of JULY is the most

[1] Geoffroy—Traité de Matière Médicale.

fit time for this purpose. The bulb is then of its greatest size, it is firm, amylaceous, and extremely bitter. The *bitterness* is the character which affords the best criterion of its activity.

According to some, the amount of *Starch* and firmness in the bulb are the proper guides; but the amount of active principle does not necessarily bear any corresponding ratio to that of the starch, in proof of which I may observe, that the bulb, when more spongy and watery, and less amylaceous, as in *April*, possesses almost as much bitterness as when nearly mature,—a circumstance remarked by Dr Christison, and which I have confirmed by repeated observation.

I feel confident that we can place no reliance in a test of goodness proposed by Dr A. T. Thomson.

In 1820 Dr Thomson[1] published a paper showing the tincture of *Guaiacum* to be a test for *Gluten*, and pointing out its applicability as a test for the goodness of COLCHICUM. His manner of procedure was as follows:—Ten grains of the bulb were rubbed in a mortar, with sixteen minims of distilled vinegar, and immediately afterwards sixteen minims of the *tincture of guaiacum* were added. A beautiful cœrulean-blue colour was produced with those specimens which, according to Dr Thomson, were good.

I have several times made, with specimens which I knew to be good from their bitterness, similar experiments, and obtained no cœrulean-blue colour, but only a dirty brown.

In the same year (1820) Mr Battley[2] published similar experiments which he had made, but with entirely different success from Dr Thomson.

In order to ascertain what the true nature of this re-action might be, I expressed the juice from several bulbs, and having filtered away the starch, applied the test to the fluid; a beautiful blue colour was immediately produced. It was evident from this that the *gluten* was not the part acted on. The blue liquid was then heated well, the albumen coagulated, and the blue colour remained with the coagulum, whilst the remaining fluid was free from colour. On raising the heat to 212°, the blue colour entirely disappeared. On the other hand, the test was applied to the starch collected on the filter, but without effect. The experiment was varied in the following manner:—

The fluid was first filtered to separate *starch*, then boiled and filtered to separate *albumen*. On the test being applied both to the filtered fluid, and to the *albumen* on the filter, no blue colour was obtained.

From these experiments I drew the following conclusions:—

I. That albumen is the principle acted on.

II. That a heat above 180° destroys this action.

[1] Thomson—London Medical Repository, vol. xiv.
[2] Battley—London Medical Repository, vol. xiv.

III. That the value of this test is to prove that the bulbs have been dried at a temperature not higher than 180°.

During the summer of 1849 I endeavoured, by another process, to determine the medicinal value of the drug at different seasons, by ascertaining the amount of alkaloid contained in the bulb at monthly periods, and thus to determine the fittest time for gathering for medicinal use.

Having expressed the juice of several bulbs, and separated the *albumen* and *starch*, I attempted by precipitation in a graduated test-tube with *tincture of galls*, to determine by the bulk of the precipitate the amount of active principle. This, however, failed, on account of the precipitate partly floating to the top, and partly remaining at the bottom. This I believed was occasioned by the fluids being of different densities. A similar experiment was tried with an alcoholic solution of the bulb, but with little better success, as the small quantity of active matter procured from a necessarily small amount of bulbs gave an almost imperceptible precipitate.

At whatever period the bulbs are taken up, they should be sliced into small pieces about the thickness of a half-crown, the outer membrane having been previously peeled off. They should be then spread out upon trays to dry, either at ordinary temperatures, or at any rate not exceeding that of 150° F., after which they must be carefully preserved from moisture. (Christison.)

Mr Houlton [1] recommends that the bulb should be stripped of its dry coating, carefully deprived of the bud or young bulb, and then dried whole.

CHEMICAL HISTORY.

Vegetable chemistry has of late years made great and rapid progress, and in no way more practically useful than in the discovery and examination of the organic bases which constitute the active principles of many vegetables used as medicines.

It is hardly necessary to do more than allude to *quina* and *morphia*, as examples of the valuable contributions which chemistry has made of late years to the resources of the medical practitioner.

It happens, however, in many instances that we may be quite aware of the existence, in a medicine, of an active principle, and yet, on the one hand, from the difficulty of obtaining it pure, or on the other, from the activity of the crude drug in small doses, it may, in a practical point of view, be of little consequence to ascertain the precise chemical and other qualities of the active ingredient. Yet assuredly the more we can investigate these active principles the

[1] Houlton—Pharmaceutical Journal, vol. iv.

more precise will be our knowledge of the properties of the original drug.

The active principle of COLCHICUM AUTUMNALE was, on the authority of Pelletier and Caventou,[1] supposed to be identical with that of Veratrum album,—namely, VERATRIA. Geiger and Hesse,[2] however, discovered in COLCHICUM an alkaloid differing from veratria, and which was named by them COLCHICIA.

The following was their process for preparing it:—

The seeds were bruised and exhausted by digesting them in *rectified spirit*, acidulated by *sulphuric acid*. The excess of acid was removed by the addition of *hydrate of lime*, and the fluid filtered to separate the *sulphate of lime* which was deposited. Any excess of *lime* which might remain in the spirituous fluid was removed by the careful addition of one or two drops of *sulphuric acid*. The fluid was then filtered and distilled to recover the alcohol, and the watery residue of the distillation was mixed with an excess of *carbonate of potass*. The precipitate which fell was dried between folds of bibulous paper, and then was taken up in *absolute alcohol*, the alcoholic solution decolorised by *animal charcoal*, and evaporated for crystallisation at a gentle temperature.

By this process, it is said, COLCHICIA may be obtained also from the flowers and corms.

During the winter of 1849, and again during that of 1850, I endeavoured to procure Geiger and Hesse's COLCHICIA by this method, but without success, although I followed their process exactly. I was particularly cautious in the application of heat; for it is well known that many of the vegetable bases, such as those from *Hyoscyamus* and *Stramonium*, are very easily destroyed by an undue elevation of temperature, which may probably account for those and other similar bases not having been accurately examined and analysed. COLCHICIA is perhaps as easily destructible as *hyoscyamia* and *daturia*.

I have not been able to find that any chemists have procured crystals of COLCHICIA, except Geiger and Hesse. My account of its properties, therefore, rests solely on their authority.

"COLCHICIA crystallises from its alcoholic solution, when that is mixed with water, in colourless prisms and needles. If the alcoholic or ethereal solution be evaporated, the COLCHICIA remains in the condition of a transparent varnish-looking substance."

It was in this state alone that I procured anything which could be considered to be COLCHICIA. I am very sceptical with regard to the crystalline nature of COLCHICIA at all; for having dissolved this matter successively in *alcohol*, *ether*, and *water*, and having left

[1] Pelletier and Caventou—Journal de Pharmacie, tome vi.

[2] Geiger and Hesse—Geiger's Pharmacie, tome i. Annalen der Pharmacie, tome viii. Journal de Chimie, tome x.

the solutions to spontaneous evaporation, no trace of crystallisation ever appeared, but the bitter matter was invariably deposited in the state of a brown resinous-looking mass.

This brown mass was without smell, and possessed considerable bitterness, the bitter taste being generally followed by a slight sense of irritation in the throat, but not with the intense acrimony of VERATRIA.

"COLCHICIA in its hydrated condition has but a feeble alkaline re-action, but neutralises acids completely, and forms with them salts, which are in part crystallisable, and which have a bitter, acid, and slightly acrid taste.

"COLCHICIA dissolves pretty easily in water. It is very soluble in rectified alcohol and ether.

"It strikes a yellow colour with solution of *chloride of platinum*, but does not form an insoluble *platino-chloride* with it. *Tincture of galls* causes a white precipitate, and with *tincture of iodine* it becomes rapidly turbid, producing a russet-brown colour.

"It is persistent in the air, melts easily at a gentle heat, and is destroyed by a higher temperature." (Geiger and Hesse.)

The alkaloid VERATRIA, discovered by Pelletier and Caventou, in the root of *Veratrum album*, and in the seeds of *Helonias* or *Asagræa officinalis*, is prepared much more easily. I found no difficulty in procuring it by the process of the Edinburgh Pharmacopœia, which is nearly the same as that described by Couerbe,[1] and is as follows:—

"Grind the seeds of *Cevadilla* in a coffee-mill, and form them into a thick paste with *rectified spirit*. Pack this firmly in a percolator, and pass *rectified spirit* through it till the spirit ceases to be coloured. Concentrate the spirituous solutions by distillation so long as no deposit forms, and pour the residuum while hot into twelve times its volume of cold water. Filter through calico, and wash the residuum on the filter so long as the washings precipitate with *ammonia*. Unite the filtered liquid with the washings, and add an excess of ammonia. Collect the precipitate on a filter, wash it slightly with cold water, and dry it, first by imbibition with filtering paper, and then in the vapour bath. A small additional quantity may be got by concentrating the filtered ammoniacal fluid, and allowing it to cool."

The Pharmacopœia, I think, has erred in not ordering the immense volume of water, into which the hot alcoholic solution is thrown, to be evaporated down. In one of my operations the quantity of water amounted to twenty-four pints; and it was found quite impossible to precipitate this immense quantity by *ammonia*. It was therefore evaporated down to four pints, when an abundant precipitate was obtained.

The quantity of impure VERATRIA which was obtained from

[1] Couerbe—Annales de Chimie et de Physique, tome lii.

fifty-six ounces of seeds was *fifty grains*; but Couerbe states that *a drachm* of VERATRIA may be obtained from *sixteen ounces* of seeds; but, as DR CHRISTISON remarks, "the product to be so large must be very impure."

The impure *Veratria* which I procured was taken up in very weak *hydrochloric acid*, decolorised with *animal charcoal*, and re-precipitated by *ammonia*. It was then nearly pure white, and weighed *twenty-seven grains*.

That VERATRIA and COLCHICIA (if Geiger and Hesse's account of the latter be correct) are in no respect identical, is obvious from their great difference in properties, viz.,—

(1.) VERATRIA is entirely incrystallisable.	(1.) COLCHICIA crystallises in delicate acicular prisms.
(2.) VERATRIA possesses a powerful persistent acridity of taste.	(2.) COLCHICIA, though extremely bitter, possesses none of this.
(3.) VERATRIA, when it comes into contact with the nostrils, excites most violent sneezing. So powerful indeed is this property of VERATRIA, that when engaged in working with the seeds of *Cevadilla*, I have frequently been obliged to desist, on account of the sneezing induced.	(3.) COLCHICIA possesses no sternutatory effects at all.
(4.) VERATRIA is almost entirely insoluble in *water*. It is soluble in *alcohol* and *ether*.	(4.) COLCHICIA is very soluble in *water*, *alcohol*, and *ether*.
(5.) VERATRIA, by the action of *nitric acid*, becomes first red and then yellow. *Sulphuric acid* produces first a yellow, then a blood-red, and lastly a fine violet colour.	(5.) On COLCHICIA *nitric acid* first produces a bright violet, then an indigo-blue colour, quickly passing into green and yellow. *Sulphuric acid* colours it yellowish-brown.

These comparative characters are sufficient to establish the complete dissimilarity of these two bases.

COLCHICIA has not yet been analysed, and therefore no formula of its constitution exists.

Geiger and Hesse, although they did not analyse their COLCHICIA, ascertained its physiological properties, and compared them with those of VERATRIA.

The following experiments are related by them:—

One-tenth of a grain of COLCHICIA dissolved in weak alcohol was administered to a cat eight weeks old. There formed immediately much froth at the mouth. At the end of about an hour there were abundant liquid dejections, and then followed, after an interval, several attacks of vomiting. The gait of the animal became staggering, it fell, rolled from side to side, uttered a plaintive cry, and appeared agitated by convulsive movements. These symptoms augmented more and more, and death took place in twelve hours.	There was given, for comparison, one-twentieth of a grain of VERATRIA to a cat a little younger. The poison showed itself with much greater intensity. The animal staggered, moved convulsively, and died in ten minutes.

On opening the body, the stomach and intestinal canal were found violently inflamed, and congested throughout their entire course.

On inspection, no inflammation was found, except at the inferior part of the œsophagus, which part of the digestive tube was not inflamed in the cat poisoned by COLCHICIA.

It appears, from these experiments, that the poisonous properties of COLCHICIA are essentially those of the *irritant* class, whilst, from the rapid action of VERATRIA, and the absence of post-mortem appearances, it seems to have produced death by an action on the *nervous system*.

No other important principle has been announced as existing in COLCHICIA, except the alkaloid discovered by Geiger and Hesse. It was the substance taken by Pelletier and Caventon for VERATRIA; and, according to their statement, it was combined with *gallic acid*.

The following is their analysis of the corms :—

(1.) Fatty matter, composed of { Olein. Stearine. Volatile acid.
(2.) Supergallate of VERATRIA (*Colchicia.*)
(3.) Yellow colouring matter.
(4.) Gum. (5.) Starch. (6.) Inulin. (7.) Lignin.[1]

Stoltze[2] also analysed the bulb of COLCHICUM, and found that it contained in

	March.	October.
Volatile acrid matter,	a trace.	rather more.
Soft resin,	0·04	0·06
Crystallisable sugar,	0·41	1·12
Incrystallisable sugar,	5·91	2·72
Bitter extractive		2·17
Difficultly soluble extractive,	1·30	0·52
Gum,	0·81	1·65
Starch,	7·46	10·12
Lignin,	2·32	1·61
Extractive soluble in potass,	0·61	0·52
Water,	81·04	80·31
	99·90	100·80

We find by this analysis that in *March* the *starch* is diminished 3 per cent., and the bitter extract greatly increased.

Another analysis was performed by Melandri and Moretti.[3]

The *seeds* have only been analysed qualitatively by Buchner,[4] but his notice of the constituents is not worthy of remark.

[1] Pelletier and Caventou—Journal de Pharmacie, tome vi.
[2] Stoltze—Thomson's Organic Chemistry.
[3] Melandri and Moretti—Bulletin de Pharmacie, tome ii.
[4] Buchner's Repertorium, xliii.

PHARMACY.

Much discussion has been held respecting the comparative value of the different preparations of COLCHICUM, and especially as to whether the seeds or corms yields the most eligible forms for its administration.

"It might be reasonably expected," says Dr Barlow, "from the virtues of COLCHICUM being found to reside in the seeds as well as in the root, that the former would yield a medicine of greater uniformity, being in a state of more perfect and determinate maturity, requiring less care in the collection and preservation, and being less liable to have their powers impaired. My experience of the several preparations fully confirms this supposition."[1]

This is upon the whole the opinion most generally entertained by practical physicians.

The employment of the *seeds* in preference to the *root* was first insisted on by Dr Williams of Ipswich.[2]

There are at present seven preparations of the bulb and seeds of COLCHICUM officinal in the three British Pharmacopœias; but of all these there are perhaps only four which can be considered as in use at the present day. These are,—*Acetum Colchici*, E. L. D.; *Extractum Colchici Aceticum*, E. L. D.; *Tinctura Colchici*, E. L.; and *Vinum Colchici*, E. L. The *acetic* forms answer best as *diuretics*, perhaps because they are weaker preparations, and not so apt to act upon the bowels.

The *tincture* and *wine* are the preparations employed for general purposes; but when it is desirable to exhibit COLCHICUM in the form of pill, the *acetic extract* is certainly the most eligible form.

PHYSIOLOGICAL EFFECTS.

It is very difficult to state in a precise and definite manner what the action of COLCHICUM is, or to what class of medicinal agents it ought to be referred.

In medicinal doses it seems to have the property of lowering the heart's action, and to affect most of the secretions of the body; and hence, according to the circumstances under which it is administered, it may produce *diuretic*, *emetico-cathartic*, or *diaphoretic* effects.

It has been regarded by some as an *expectorant;* and by others it is supposed to have a peculiar effect in stimulating the *hepatic system*.

It has also been regarded as having a powerful influence over the *uterus*.

From the marked effects which it produces in GOUT and RHEU-

[1] Cyclopædia of Practical Medicine—Gout.
[2] Williams—London Medical Repository, vol. xiii.

MATISM, it has been regarded as possessing a *specific* action in those diseases; but this may be said to be a mere statement that it acts powerfully and successfully, for it does not appear that it often alleviates those diseases, without producing in a well-marked degree some of its ordinary physiological effects, such as lowering the pulse, causing *diarrhœa*, *diuresis*, or *diaphoresis*.

In large doses there can be no doubt that it is an active *narcotico-acrid* poison; but its action seems to be more due to *acrid* than to *narcotic* properties, as the effect on the brain is generally secondary to that on the intestines.

One of its most remarkable physiological effects was discovered by Chelius of Heidelberg.[1] He found that the URIC ACID contained in the urine of those taking COLCHICUM was nearly doubled in the space of twelve days. In one case the urine before taking COLCHICUM contained 0·069 per mille of URIC ACID; four days after commencing to take the COLCHICUM the proportion was 0·076; on the eighth day, it was 0·091; and on the twelfth day, it was 0·102. Chelius obtained the same results in other instances.

Dr Christison[2] examined the urine of a patient taking COLCHICUM, and he found that in two days the quantity of UREA was nearly doubled. In the urine before taking COLCHICUM there was no deposit of *lithate of ammonia*. Its density 1020. It contained above forty-seven parts of solid matters in the thousand, and of this quantity twenty parts were UREA. The specimens of urine passed on the first and second days after commencing to take COLCHICUM were exactly alike. They were very turbid, and their turbidity disappeared with a gentle heat; the deposit was evidently *lithate of ammonia*. The density of the first was 1033·5, and that of the second was 1034, which are both very unusually high for urine not *diabetic*. As they were obviously identical in their nature, Dr Christison only analysed the second. It contained seventy-nine parts of solid matters in a thousand, and of this quantity thirty-five were UREA. Dr Christison suspected that the quantity of urea was even greater, for not having added an excess of *nitric acid*, some of the *nitrate of urea* might have remained in solution.

Through the kindness of Dr Halliday Douglas, I had an opportunity of examining the effect of COLCHICUM on the urine of a sailor, who was a patient in the Royal Infirmary. He was under treatment for secondary syphilis, but was otherwise healthy. I was permitted to give him a few doses of COLCHICUM, in order that I might ascertain the physiological action of that agent on

[1] Chelius—Archives Générales de Médecine, tome xviii. Chelius—Annales Cliniques de Heidelberg, 3me vol. *Vide* paper by Dr Lewins—Edinburgh Medical and Surgical Journal, vol. lvi.
[2] Christison—Lewins, op. cit.

the kidneys, but before doing so I examined his urine. The density was 1025. It contained no deposit, nor was it affected by *heat* or *nitric acid*. It contained :—

Total solids,	27·500
Water,	972·500
Urea,	12·360
Uric acid,	0·231
Inorganic salts,	7·436
Organic matter,	7·423
Total,	1000·000

Here it will be perceived that both the UREA and URIC ACID were slightly deficient, if we compare it with the standard of healthy urine, as given by Becquerel.[1] Density 1018·9 Contains :—

Total solids,	31·185
Water,	968·815
Urea,	13·338
Uric acid,	0·391
Inorganic salts,	7·695
Organic matter,	9·261
Total,	1000·000

On the third day, after commencing to take COLCHICUM, the urine was examined. It possessed a slight turbidity, which, however, was dissipated by heat. Density 1030. It contained :—

Total solids,	29·650
Water,	970·350
Urea,	15·500
Uric acid,	0·491
Inorganic salts,	6·350
Organic matter,	7·209
Total,	1000·000

Here, it will be observed, the UREA was increased by *one-fourth*, the URIC ACID nearly *doubled*, and the inorganic salts and inseparable organic matters were considerably decreased.

The urine was again examined on the sixth day after commencing to take the COLCHICUM, with the following results. Turbidity rather increased. Density 1034. It contained :—

Total solids,	33·460
Water,	966.540
Urea,	18·341
Uric acid,	0·750
Inorganic salts,	7·436
Organic matter,	6·933
Total,	1000·000

[1] Becquerel—Semeiotique des Urines.

Here, then, the physiological action of COLCHICUM in increasing the UREA and URIC ACID was well marked.

Having obtained these results from this case (which are only corroborations of many others), it was not considered justifiable to proceed further with the administration of COLCHICUM with this patient.

It has been supposed that under the use of COLCHICUM a remarkable change takes place in the system,—namely, that the URIC ACID becomes converted into UREA; but this has not at all been substantiated, and from the above cases of Chelius, and the analyses which I have just noticed, we must be led to suppose that no such change occurs, but that an increase in both those principles is the result.

Dr Graves[1] states, that the beneficial action of COLCHICUM is not owing to its producing a more rapid excretion of *lithates* through the kidneys, but to the remarkable property the plant possesses of altogether putting a stop to the morbid formation of *lithates*.

Dr Gairdner[2] says, that he has always found that the increase of UREA was accompanied by a corresponding diminution of the *urates* in the urine. But, from the above experiments, I am inclined to believe that both of these suppositions are erroneous.

With a view to ascertain the power of COLCHICUM as a *sedative* I made the following experiments,—in the first, my pulse being 87; in the second, 84. On both occasions twenty minims of *Tinctura Colchici* were taken.

At 8 P.M.	...	...	Pulse 87	At 6 P.M.	...	...	Pulse 84
9 „	...	...	„ 87	7 „	...	...	„ 84
10 „	...	...	„ 80	8 „	...	...	„ 78
11 „	...	...	„ 75	9 „	...	...	„ 72
11½ „	...	...	„ 70	10 „	...	...	„ 66
12	...	...	„ 65	11 „	...	...	„ 60
12½ A.M.	...	...	„ 65	12	...	...	„ 62

No other physiological action was manifested, except slight nausea.

POISONOUS ACTION.

In large doses, COLCHICUM proves a violent *irritant* poison. The symptoms occasioned by it are,—"Severe vomiting and urgent diarrhœa, with a sense of burning in the throat, excessive colic, and heat in the abdomen; great depression of the circulation, and sometimes suppression of urine.

"Sometimes no other symptoms exist, and death takes place from *exhaustion*, the effect of *inflammation* of the bowels. Sometimes death is preceded by *headache, delirium, stupor*, and *insensibility*, denoting an action upon the *nervous system*." (Christison.)

[1] Graves—London Medical Gazette, vol. vii.
[2] Gairdner on Gout. London, 1849.

POISONOUS ACTION ON ANIMALS.

Orfila[1] states, that he has frequently given two or three bulbs to dogs in *June*, without producing any sensible effects; this induced him to believe that climate and the season of the year have great influence on their deleterious properties. This, however, is the season of the year when the bulbs are supposed to possess their greatest activity.

Mr Want states, "that cattle are affected by it only at the spring of the year, when the seed-vessel is fully mature."

"It happens that the seed, if swallowed, adheres to the coat of the stomach, producing at the several points of its adhesion spots of inflammation, which occasion the death of the beast."

"It is a curious fact, that they are affected by the recent plant only; for when dried and made into hay it loses its deleterious property, and is then eaten by them with impunity."[2]

Sir Everard Home[3] injected 160 drops of the vinous infusion of COLCHICUM into the jugular vein of a dog. The animal immediately lost all power of voluntary motion; the breathing became extremely slow, and the pulse was hardly to be felt.

In ten minutes the pulse was 84; inspirations natural (40 in a minute). In twenty minutes the pulse was 60; inspirations 30; and a tremulous motion had taken place in the hind legs. In an hour the pulse was 115, and irregular. The animal was capable of sitting up, but was in a state of violent tremor; the inspirations could not be counted. In one and a half hours, the tremor had gone off; pulse the same; the animal made ineffectual attempts to vomit, and continued to do so for ten minutes, with great langour; inspirations, 54. In two hours the pulse was 150, and very weak; the animal had voided an ounce and a half of urine; had vomited twice, each time bringing up a quantity of mucus, tinged with bile, and had two liquid stools. In three hours had vomited again, and had another stool; pulse too weak to be counted. In four hours continued extremely languid; and in five hours vomited some bloody mucus, and expired.

Autopsy.—The *stomach* contained mucus tinged with blood, and its internal surface was *inflamed*. The *duodenum* had its internal surface universally *inflamed*. The same appearance was met with

[1] Orfila—Toxicologie, vol. ii.
[2] Want—London Med. and Phys. Journ., vol. xxxii.; Annals of Philosophy, vol. iv.
[3] Philosophical Transactions, vol. xvi., part 2.

in the *jejunum* and *ilium*, and also in the *colon*, where it was more strongly marked than in the *ilium*.

Another case, with somewhat similar results, is recorded by Sir Charles Scudamore.[1] He injected 160 drops of the vinous infusion of COLCHICUM into the jugular vein of a strong dog. For the first fifteen minutes he did not seem to suffer the least inconvenience. In an hour and a quarter he was sitting on his hind legs, the eyes were bright, and there did not appear any remarkable change. In five hours he was still capable of sitting up, but appeared much dejected; and there was some difficulty of breathing, attended with an occasional husky cough. His pulse was 113; the inspirations were 56. In five hours and a quarter he vomited some bloody mucus, and expired.

Dissection.—The *stomach* was in a state of *gangrene*. The *duodenum*, *jejunum*, and *ilium*, were in a high state of *inflammation*, approaching to *gangrene*. About two ounces of highly offensive grumous blood were found in the stomach; there was also blood in the duodenum, but not offensive. The *colon*, *cæcum*, and *rectum* were much *inflamed*; with here and there deep rose-coloured spots, of the size of a pea. The bladder was nearly full of urine, of a deep saffron colour; the gall-bladder was much distended with bile. There was an effusion of bile upon the liver.

Scudamore made an experiment also with the expressed juice of COLCHICUM.

At forty minutes past 1 o'clock P.M., 120 drops of the expressed juice of the fresh roots of COLCHICUM were injected into the jugular vein of a young terrier. Immediate signs of great debility were produced; he passed a natural alvine discharge.

In about two minutes he vomited half an ounce of frothy bile, of a gamboge colour. Rising upon his legs he staggered as if intoxicated, and immediately fell. In five minutes the respirations were 52. In seven the eyes were fixed, the pupils contracted; the extremities were stiff, and drawn up.

In ten minutes he was upon his legs, passed a scanty bilious discharge, walked about, and soon again made great efforts, without effect, to relieve himself, uttering at the time a cry of distress. He ran into a dark part of the room. In lying down he had some r igors, and there was a profuse salivation.

Three o'clock.—He was on his legs, with his back raised, and showing signs of pain in the bowels. The inspirations were 42. He seemed capable of walking, but was very languid.

At *four o'clock* the lassitude had increased, and he supported himself with difficulty on his legs; a copious discharge of mucus and saliva was proceeding from the mouth.

[1] Scudamore on Gout and Rheumatism, 1819.

A little before *five o'clock* he appeared to be suffering much, was moaning continually, and took no notice on being disturbed.

At *six o'clock* he was still much distressed on his inspirations, being only 12 in a minute; the eyes were fixed, the teeth firmly closed, and he appeared to be dying.

At *seven o'clock* there was no perceptible change, except that his inspirations had increased to 14 in a minute.

Nine o'clock.—He respired only 8 times in the minute with much difficulty. His moaning was much fainter.

Ten o'clock.—He was found dead, and was quite cold.

Dissection.—The *stomach* was highly *inflamed*, containing about an ounce of dense mucus, mixed with grumous blood; the *duodenum*, *jejunum*, and *ilium*, were highly *inflamed*; the inflammation decreasing in the *colon*, *cæcum*, and *rectum*.

The following experiment with *Eau Médicinale*, whose principal constituent is supposed to be some preparation of COLCHICUM, probably the *flowers*, is narrated by Scudamore:—

Sixty minims of Eau Médicinale, with the sediment which it forms shaken up, were given to a very strong rough terrier, at half-past ten A.M.

Two o'clock.—He was lying down, and looked lethargic.

Half-past Four.—Pulse 96, vibrating and intermitting every five beats.

Eight o'clock.—Pulse was softer; he had vomited some frothy mucus, and appeared very languid.

Next morning.—Pulse 164, and irregular. The dog had recovered his strength.

Ten o'clock.—A further dose of 160 drops was given.

Half-past Two.—He looked dejected; the pulse was 104, and very irregular.

Four o'clock.—Had brought up some opaque, viscid mucus.

Six o'clock.—Had vomited a quantity of frothy slime mixed with blood, and appeared altogether very ill. Rigors; pulse 80, and small, with intermissions after every five or six beats.

Half-past Nine.—Seemed dull and languid; pulse 106.

On the following morning, at ten o'clock, he was found extended on the ground; had voided a quantity of urine. He was quite insensible, and now and then stretching out his limbs. His inspirations were 6 in a minute.

At *one o'clock* he did not seem to suffer.

Half-past Two.—He was stretching himself out, as if in the act of dying. There were slight convulsions of one of the legs. The pulsation of the heart was not to be felt; and no distinct respiration could be observed.

At *three o'clock* he had expired.

Dissection.—The *stomach* was highly *inflamed*, and contained a dark-brown fluid. The marks of *inflammation* increased in the *duo-*

denum, and through the *jejunum;* decreased in the *ilium*, and increased again in the *colon*, which appeared in a state of general ecchymosis, from venous blood extravasated under the mucous membrane. The *cæcum* and *rectum* were highly *inflamed*.

Various other experiments with the different preparations of COLCHICUM are noticed in Scudamore's work on gout, but these it is unnecessary to detail.

Dr R. Lewins,[1] in an essay on COLCHICUM, describes several experiments which he made on the lower animals with different preparations of that plant.

On the 15th December, 70 minims of the *Vinum Seminum Colchici* were administered to a middle-sized dog, without any immediate sensible effect.

A short time afterwards it devoured a large quantity of meat very greedily, and continued gnawing bones for some time with great avidity.

At *seven* P.M., nearly four hours after he had swallowed the COLCHICUM, he ate another large quantity of beef, and lapped barley-broth with great eagerness. He was visited for the last time that night about *nine* P.M., when he appeared in his usual state of health.

Next morning, at *half-past eight*, sixteen hours after the COLCHICUM had been given, he seemed weak, low, and very sick. He remained prostrate on some straw in the corner of the room, and could not be induced to move. During the night he had been most severely purged, and in every part of the room were egesta from the stomach, in some places mixed with a fluid of a dark brown colour, in other places mixed with food; and near where he was lying there were large watery evacuations, intimately mixed with a fluid resembling blood. No attempts were made to vomit during the visits on this day, nor did he express by outward symptoms any indication of suffering acute pain. The eyes were hollow, and had a dull glazed appearance. On presenting food of the same kind that he devoured greedily the previous afternoon, he would not touch it. The prostration of strength and insensibility to external impressions became greater and greater throughout the day.

On visiting him next morning, at a little after *eight o'clock*, he was quite dead, cold, and stiff. The food which had been placed before him yesterday morning had never been touched.

Dissection.—The body, examined at *half-past eleven*, presented the following appearances:—The *intestines* were found very much *contracted* and *vascular*. The internal surface of the *stomach* presented rather more rugæ than natural, and was lined with mucus; its cavity was nearly full of dark brown coloured bile, and the

[1] Lewins—Edin. Med. and Surg. Journ., vol. lvi.

pyloric orifice was contracted. The *duodenum* was much injected, and coated with mucus; the whole course of the *jejunum*, and upper part of the *ilium*, were of the most intense red colour. On the lower part of the *ilium* were observed a number of dark streaks, slightly raised, running in a longitudinal manner. The *large intestines* were likewise very *vascular*, although not so vivid as in the small intestines. In the *ilium* a large tapeworm, measuring considerably upwards of a foot, was found dead. There was not the slightest appearance of food or fœcal matter in any part of the intestinal canal; a large quantity of bloody serosity, mixed with thin mucus, lined the parietes in almost their whole extent. The *gall-bladder* was full of dark-brown bile, and the *urinary bladder* was distended with natural coloured urine. All the other organs were perfectly normal.

Dr Lewins found that, notwithstanding the powerful effects which COLCHICUM produced upon men and dogs, it acted with very different degrees of energy upon other classes of animals, and with the view of ascertaining in what respect this action is different, he made the following experiments:—

On 7th December, half a drachm of the *Vinum Seminum Colchici* was administered to a small rabbit. It commenced eating immediately afterwards; and on the following day nothing unusual was observed, except that it appeared to have passed a larger quantity of urine than natural.

On the 8th, at *six* P.M., twenty-four hours after the last dose, one drachm was administered, and with the exception of a *diuretic* effect, no particular change was observed.

On the 9th, no perceptible effect having resulted from yesterday's dose, at *nine* P.M., twenty-seven hours after the last experiment, two drachms more were swallowed, and no evident change was observed in the animal.

On the 10th, at *six* P.M., twenty-one hours after the last dose, three drachms more were given. After one drachm had been introduced, the rabbit began to squeak, and struggle violently; and on being let loose ran about as if in pain. The same effect followed after the exhibition of the second dose; but after the third drachm it began to eat, and appeared quite as lively as usual.

Thus to a very small animal, in the course of four days, *six drachms and a half* were given (more than six times the quantity which proved fatal, with the most violent symptoms, to a dog), with little effect except acting upon the kidneys.

Another case is mentioned, where *seventeen drachms* were given in *six* days, without any material change being produced on the animal. An experiment was also made on a cold-blooded animal,—viz., a frog. In this case, in the course of *six* days, 350 *minims* were administered, with comparatively very slight effects

being produced, and which might very well be attributed to the quantity of wine swallowed.

From the results of these investigations, Dr Lewins says, it appears that we are warranted in concluding, that the action of COLCHICUM is most decided upon carnivorous and omnivorous animals, whilst its action on herbivorous, graminivorous, and cold-blooded animals is comparatively feeble.

POISONOUS ACTION ON MAN.

THE following cases of poisoning by the various preparations of COLCHICUM are illustrative of the fact which has been pointed out, that its action in this respect is due more to *acrid* than to *narcotic* properties, inasmuch as the symptoms of the latter, when they appear at all, are generally subsequent to those of the former. In all the cases—*colic, vomiting*, and *purging, slow and almost imperceptible pulse*, and great *prostration of strength*, are represented as having occurred, whilst only in three was there any distinct manifestation of an action upon the *nervous system*. In one case only does the action on the nervous system *precede* the symptoms of acrid poisoning, and in this, *convulsions*, followed by complete *opisthotonos* and *paralysis*, were present. In three cases, the *pupils* were remarked to be *dilated;* in one, *contracted;* in the majority, *suppression of urine* existed; but in one, *diuresis* was present from the time of poisoning to that of death—a period of six weeks.

The post-mortem appearances are in general *redness* and *inflammation* of the intestinal canal; but in the cases mentioned by Chevallier and Caffe, no morbid appearances existed.

The following case, illustrative of the poisonous effects of the *seeds* of COLCHICUM, is narrated by Mr Fereday, of Dudley:[1]—

I.—David Cole, æt. 44, a stout muscular man, feeling pains in his bowels, to which he was subject, on the morning of 8th March, about six o'clock, swallowed, believing it to be rum, about two ounces of wine of the seeds of COLCHICUM.

He immediately discovered his error, but knowing its effects in small doses, conceived it would be followed by vomiting and purging sufficient to avert mischief. He sought no medical aid till four in the afternoon, when he was first seen. He was sitting on a chair, his elbows on his knees. He said that he felt no inconvenience for an hour and a half after taking the dose, when pains in the bowels came on; but that he continued his work until eleven o'clock, when pains in his stomach and bowels, retching, and copious vomiting of a yellowish fluid, compelled him to desist.

Four o'clock p.m.—He describes the pain in the epigastrium as agonising, and says it is like a knife piercing him. The retching is incessant and extremely violent, but no fluid is evacuated; there is tenesmus; a small quantity of fœcal

[1] Fereday—London Medical Gazette, vol. x.

matter has passed. No tenderness on pressure, either in the epigastrium or abdomen. The appearance of the tongue is natural; the pulse small, slow, and feeble; breathing not much affected; the feet cold; his countenance is anxious; features sharp; his cheeks, lips, and palpebræ purple. On attempting to walk, says he thinks he shall lose the use of his limbs.

A mustard emetic was given, followed by copious draughts of warm water and gruel. These were soon returned, with apparently no admixture. Cathartic medicine was given, and immediately returned. Was put to bed; warm bricks were applied to the feet, and hot flannels to the stomach. To take forty drops of laudanum immediately; gruel and coffee plenteously.

Nine o'clock p.m.—The retching, vomiting, and pain in the stomach continue with undiminished violence; the fluid vomited contains a sediment like coffee grounds; he complains greatly of thirst; has made little water. Twenty drops of laudanum every two hours; a blister to the epigastrium; sinapisms to the feet; an enema every hour.

9th March, six o'clock a.m.—Has passed a sleepless night; the symptoms remain unaltered; the eyes are sunk; feet warmer; skin generally natural; no perspiration; pulse scarcely to be felt; respiration hurried; great thirst; no urine. Enemata returned without fœcal matter; camphor, calomel, and opium every three hours; an effervescing draught with brandy every hour.

Eight o'clock p.m.—The retching and pains continued until four o'clock, when the bowels were much distended. Has since had copious liquid stools, dark coloured, and very offensive, and expresses himself better. Makes a few drops only of urine; loses his sight for a minute or two after getting out of bed to the night chair; the pulse is scarcely perceptible, and occasionally intermits; he is perfectly sensible, but talks with effort; calls continually for water. Aromatic confection, carbonate of ammonia, and camphor mixture, with brandy, every hour.

10th March.—In the course of the night his stools passed involuntarily, and in great numbers, his weakness increased, and he died a few minutes before five o'clock this morning, perfectly sensible to the last moment.

Sectio Cadaveris.—The face, neck, upper and front part of the thorax, insides of the arms, front of each forearm, and insides of the thighs, were covered with patches of a purple efflorescence, as were also the integuments of the scrotum and penis. The muscles of the forearm were very rigid, and their fibres contracted into hard knobs. The great omentum, instead of covering the front of the intestines, was turned up between the stomach and convex surface of the liver behind, and the diaphragm in front, from the efforts of vomiting. There was increased redness in a portion of the peritoneum covering the jejunum. The stomach and bowels were coated with a thick, tenacious, but colourless mucus. On a portion of the mucous membrane of the stomach, near the cardiac orifice, and corresponding to its great arch, was a patch of redness, about the size of a half-crown piece; its secretion here did not vary in tenacity, quantity, or colour, from that of any other portion of the membrane. Upon dividing it at this part, its section presented nothing beyond its usual appearance; there was no pulpiness, no thickening, but a small quantity of blood was effused between it and the muscular coat, giving the reddened internal appearance. Careful examination of that portion of the reddened peritoneum covering the jejunum, demonstrated the like hemorrhagic condition of the blood-vessels. Blood was effused between the peritoneal and muscular coats; but the mucous membrane corresponding to this portion was perfectly healthy, at least it was perfectly free from inflammation. No other trace of inflammation was observed in other portions of the abdominal viscera. The gall-bladder was distended with healthy bile, the urinary bladder was contracted and empty.

II.—Case of poisoning by a decoction of the *seeds* of COLCHICUM, by Dr Newbrandt.[1]

Caspar B., of Aesthausen, æt. 52, of a sanguine temperament, drank, by mistake, on the night of the 18th February 1830, some of a decoction made with a large spoonful of colchicum seeds and three pints of water; he had, in the night, more than fifteen stools and vomitings. When Dr Newbrandt saw him next day, he was in a disturbed state. The stools and vomitings were less frequent; the patient, although weak, did not complain of any pain, and could raise himself; the abdomen was not distended, and it contracted spasmodically on being touched; the pulse was small and frequent; the stools, which were very fœtid, contained small whitish membranes. The patient was made to drink a great quantity of warm water containing butter. This drink provoked vomiting and stools. Immediately after, coffee was ordered, and a strong infusion of marsh-mallow with lemon-juice. Next morning, the 20th, at eight o'clock, the physician found his patient in the following state:—

Face pale; respiration precipitate; eyes sunken; pupils much dilated; tongue covered with a whitish matter, and could be put out only with difficulty; region of the stomach rather painful; breath, face, and extremities cold; pulse very frequent, scarcely perceptible; no thirst; stools more frequent since last evening, and containing matters of a light blue colour. The patient took with pleasure some mucilaginous soups and coffee. Although he replied correctly to questions addressed to him, his intellectual faculties seemed to be confused. Death at ten o'clock.

Sectio Cadaveris, 23 hours after death.—Countenance unaltered; pupils much dilated; eyes sunken; the abdomen scarcely more swelled than during life, was of an extraordinary hardness, and showed peculiar stains, more numerous in the cavity of the stomach, and at the sides, towards the back; they were violet, greenish-blue, not circumscribed. The muscles were of a deep blue when dried in the air. The trachea, towards the bifurcation, was inflamed. The lungs collapsed, small, pale, and soft to the touch, containing much coagulated blood; on their surface were large black, violet, and brownish spots. The œsophagus was brownish-red at its opening into the stomach. The cardia was of a violet-black colour. The stomach, at its exterior surface, was of a light violet, and much deeper at the interior; the veins of the stomach and other intestines were greatly distended with perfectly black blood. The liver had a violet tint at its concave surface. The gall-bladder was bulky, and full of green bile. The large and small intestines were hardly inflamed without, and showed only a few red, brownish spots within. The other organs presented nothing abnormal.

III.—In the same journal as the above, a fatal case of poisoning by the *leaves* of COLCHICUM is mentioned.

IV.—Blumhardt[2] relates a case of poisoning caused by an infusion of a large tablespoonful of the *seeds*.

In three quarters of an hour the man was seized with griping, and then profuse diarrhœa and vomiting. Next morning, twelve hours after the poison was taken, the physician found him still affected with vomiting and purging, but not with pain. He seemed indeed to suffer so little, and to improve so much under the use of emollients, that he was thought to be fairly recovering; but next day the pulse was almost imperceptible; the countenance and extremities were cold; the voice hoarse; the breathing hurried; the eyes sunk; pupils dilated; the epigastrium tender; and the forehead affected with pain. He died at twelve the same day.

[1] Newbrandt—Medicinisches Correspondenz-Blatt.—The Chemist, vol. i., 1840.

[2] Blumhardt—Repertorium für die Pharma

V.—M. Ollivier[1] met with two cases of death within twenty-four hours, in consequence of a tincture being taken, which contained the active part of forty-eight grains of the dry *bulb*; and a third case of death in three days, caused by three doses of a watery decoction, made each time with forty-six grains of the bruised *bulb* collected in *July*. Severe purging and prostration followed each dose. There were no symptoms of any affection of the brain.

VI.—A case is mentioned by Chevallier[2] of fatal poisoning from the intentional administration of a vinous infusion of the dry *bulb*, in which death took place in three days, preceded by violent burning in the intestines, great thirst, frequent vomiting of mucus, and intense suffering. The dissection revealed no morbid appearance at all.

VII.—Three American soldiers, who drank by mistake a large quantity of colchicum wine, prepared from the *bulb*, died with symptoms of burning pain, urgent thirst, and frequent vomiting of mucus. One of them, who took eighteen ounces, and died in two days, presented the leading symptoms of malignant cholera,—viz., frequent vomiting; copious rice-water stools; cramps of the abdominal muscles, and flexion of the extremities; coldness of the skin, tongue, and breath; blueness of the nails; dull sunken eyes, contracted pupils, and collapse of the features. The two others had at first similar symptoms, which passed into those of chronic dysentery, and proved fatal in a few weeks.[3]

VIII.—M. Caffe[4] relates the case of a young lady, who, in order to destroy herself, took five ounces of the wine of colchicum. She was soon seized with acute pain in the stomach, then with frequent vomiting; general coldness and paleness; a sense of tightness of the chest, and oppression of breathing; a slow thready pulse, and extreme prostration; and subsequently, with severe and constant cramps in the soles of the feet. In eleven hours she had less frequent efforts to vomit, but was excessively exhausted. In twenty hours the pulse was imperceptible, and in two hours more she died.

There was no suppression of urine; no purging; no diminution of sensibility; no delirium; no convulsions; no change in the state of her pupils.

About a twelvemonth afterwards, her sister destroyed herself by taking the same preparation, of which she took the same quantity, and she died with exactly the same symptoms in twenty-eight hours.[5]

On examination, in neither of these cases was there any inflammation detected.

IX.—Mr Taylor[6] records the case of a gentleman, who, in November 1839, swallowed, by mistake, one ounce and a half of wine of colchicum. He was immediately seized with severe pain in the abdomen, other symptoms of irritation came on, and he died in seven hours. No post-mortem examination was required by the coroner!

In another instance, in which an ounce was taken, death occurred in thirty-nine hours.[7]

Mr Taylor also mentions an interesting case of poisoning by the medicinal administration of colchicum, communicated to him by Mr Mann. Three and a half drachms of the wine of colchicum were taken in divided doses, and

[1] Ollivier—Journal de Chimie Médicale, 1839.
[2] Chevallier—Journal de Chimie Médicale, viii. Second Series. 1832.
[3] Repertorium für die Pharmacie, lxxi.
[4] Caffe—Annales d'Hygiène Publique, xvi.
[5] Annales d'Hygiène Publique, xii.
[6] Taylor's Medical Jurisprudence, p. 268.
[7] Schneider's Annalen, i., 232.

caused death on the fourth day. There was no inflammation of the mucous membrane, but simply extravasation of blood into the mucous follicles.[1]

X.—One ounce and a half of the vinous tincture of colchicum was by mistake givenone evening to a feeble man, æt. 56, labouring under chronic rheumatism. No complaint was offered for at least one hour after, but then retching came on, with acute pains referred to the stomach, to which vomiting and purging soon supervened. This state continued the whole succeeding night, and a great part of the day following, when the alvine evacuations ceased; but the most distressing nausea continued, with frequent retching. The stools were in the course of the night often involuntary, but not bloody. Excessive thirst came on the day after the accident, and continued till death, with severe pains of the stomach and bowels, which occasioned fomentations to be employed. In the evening the patient seemed nearly exhausted, delirium appeared, the pulse was scarcely perceptible. He lived, however, through the second night, but died the following morning. On dissection, there was no appearance of inflammation of the bowels, but redness of the stomach.[2]

XI.—M. Leroy des Barres[3] has reported to the Academy of Medicine the following case of poisoning by Colchicum:—

A female, æt. 57, suffered from pain in the epigastrium. Her medical attendant prescribed for her thirty grammes (an ounce) of tincture of colchicum, of which she was to take a teaspoonful night and morning in a simple julep of taraxacum. Before commencing this treatment, she was directed to take a purgative draught, composed of syrup of buckthorn and sulphate of soda. By some unfortunate mistake, the whole of the colchicum was swallowed instead of this draught. In five minutes she felt severe pain in the stomach and bowels, and there was great anxiety. In this state she was seen by M. des Barres. Her face was pale, the features contracted, and the eyes sunk. The pain in the abdomen was very severe. She vomited once a glairy mucus-like matter, and this was followed by several liquid dark-coloured stools, accompanied by violent colic. The patient complained of a sense of suffocation and strangulation. The pulse was weak, and only fifty in the minute. The extremities were cold, vision was not affected, and the intellect was clear. Small doses of tartar-emetic were administered. These brought away a yellowish-coloured fluid, having a spirituous odour, like that of the tincture of colchicum. Vomiting was promoted by draughts of warm water, and the patient then took the ioduretted water recommended by M. Bouchardât; this appeared to relieve the cramps in the stomach and the colic pains. In about an hour the dose of ioduretted water was repeated. In two hours the patient still continued to suffer from incessant vomiting, with cramps in the muscles of the legs and arms. The extremities were cold, and the lips and arms had a livid hue. Frictions were employed, stimulating poultices were applied to the abdomen, and sinapisms to the feet. The patient still continued to take occasional doses of the ioduretted water. Thirteen hours after the poison had been swallowed, the woman was suffering from great prostration of strength, vomiting, diarrhœa, cramps in the limbs, twitchings of the tendons, great agitation, and severe pain in the abdomen; the pulse was 65; only a few drops of urine had been passed. On the following day the symptoms continued, the pulse having risen to 90. The heat of the body was more equally distributed, the tongue was dry, thirst intense, and there was entire suppression of urine. The cramps and convulsive motions of the limbs, with the feeling of strangulation, had disappeared. Leeches were

[1] Taylor—Op. cit.
[2] Edin. Med. and Surg. Journ., vol. xiv.
[3] Leroy des Barres—Gazette Médicale de Paris, 1848.—Journal de Médecine de Bourdeaux, 1848.—Monthly Journal of Medical Science, 1849.—London Medical Gazette, March 1849.

applied to the abdomen, and emollient medicines prescribed. In the afternoon the patient had considerably improved, and urine was freely secreted. On the fifth day the fever had disappeared, but there was still some diarrhœa. In the course of a week or ten days the patient had entirely recovered.

In this case the employment of M. Bouchardât's antidote seems to have been of no use whatever.

XII.—Dr Bleifus[1] has related the following case of poisoning by the *leaves* of Colchicum:—

A man gathered the leaves in the beginning of May, and after cooking them, ate about two ounces for supper. In six hours he was seized with violent colic, vomiting, and purging. In fifteen hours, when his physician first saw him, the countenance was ghastly, as in malignant cholera, the pupils dilated, and, scarcely contractile, but the mind entire. He complained of rheumatic pains in the neck, and burning pain in the pit of the stomach. He had frequent vomiting and purging, spasms of the abdominal muscles, coldness of the skin, a small, slow, wiry pulse, cramps of the fingers and calves of the legs. Coffee and lemon juice allayed the vomiting, and a temporary amendment ensued; but early on the third morning he became worse, and soon after the narrator of the case found him dying.

XIII.—The *flowers* are not less poisonous than the leaves, bulbs, and seeds. A case is mentioned in "Geiger's Journal," of poisoning with a decoction of some handfuls of the flowers, where death occurred in twenty four hours, under incessant colic, vomiting, and purging. In this case the stomach and duodenum only were inflamed.[2]

Another case is mentioned by Garibel, of a servant who died from the effects of poisoning by the *flowers*, which were given to cure intermittent fever.[3]

XIV.—The following case of poisoning by the *bulb* of Colchicum, taken for the purpose of procuring abortion, is recorded by Mr Dillon.[4]

Susan Laing, was about 30 years of age, and of good health and constitution. She was about two months gone in pregnancy with a bastard child, and having read in a newspaper that a woman had caused abortion by taking meadow saffron, she determined on getting rid of her burthen by a similar measure. She accordingly procured some, and having made an infusion, took it on an empty stomach, early on the morning of the 10th March 1827. Mr Dillon was called to her about four o'clock in the afternoon of the 11th, and on inquiry learnt that she had miscarried the preceding evening. He found her in a very hopeless state, her extremities were quite cold, and the whole of her body, particularly the hands, feet, and face, livid; the expiration was hurried, and the pulse could not be felt at the carotids, and but faintly at the heart. Notwithstanding, the sensorium was undisturbed, and she gave a clear account of what she had done, her motives for so doing, and the effects the poison had on her. She said, that in about half an hour after she had taken it, her stomach became sick, griping came on, and a violent purging, which continued with great severity. She had had no medical assistance, and was so tormented with pain and purging, that she had no sleep during the night. Mr Dillon administered large draughts of brandy and spices, but to no effect, as she died two hours after.

The body was opened next day, and all the viscera were found perfectly sound, with the exception, that the mucous membrane of the stomach and bowels were dreadfully inflamed throughout.

[1] Bleifus—Repertorium für die Pharmacie, lxix.
[2] Magazin für Pharmacie, xxx.
[3] Garibel—Histoire des Plantes des Environs d'Aix.—Stephenson and Churchill's Medical Botany, vol. ii.
[4] Dillon—Stephenson and Churchill's Medical Botany, vol. ii.—Burnett's Medical Botany, vol. ii.—Beck's Medical Jurisprudence.

XV.—The last case which I shall mention is one recorded by Dr Scilling,[1] in which the effects upon the nervous system are well marked, and *precede* the symptoms characteristic of irritant poisoning. In this case *diuresis* was present from the commencement till the time of death.

A boy, six years old, who, on the 27th June 1836, had eaten of the seeds and leaves of COLCHICUM, was attacked the same night with convulsions, which soon assumed the appearance of opisthotonos. He slept for some time, but soon after another similar attack ensued, and after this had ceased, spontaneous vomiting set in. Tartrate of antimony, ipecacuan, and copper were administered. The patient lay upon his back, and rolled about his head. He passed his urine involuntarily, and his pulse became thready and tremulous. On the 28th and 29th he seemed somewhat recovered. *3d July.*—The elbow and knee joints of the left side swollen, hot, and painful; hemiplegia of right side; perfect loss of hearing; grinding of the teeth and gastricismus. *4th July.*—The right side perfectly paralytic; abatement of the other symptoms. *5th July.*—Convulsion of the whole of the left side; pulse 180. *6th July.*—The patient ate something for the first time; continual diuresis. *18th July.*—Every quarter of an hour a quantity of urine is passed; pulse 180-185, smaller and harder. *24th July.*—Convulsions and loss of feeling on left side; the pulse thready; the breathing has for some days been intermittent. On the night of the *8th August*, the convulsions disappeared; the pulse almost imperceptible. *14th August.*—Violent convulsions, in which, however, the paralytic side did not partake. At three in the morning the patient died. A dissection was not allowed. The diuresis in this case, which began within twenty-four hours after taking the poison, and only ceased at death, is well worthy of observation.

Many other cases of poisoning by COLCHICUM are on record. Too much space, however, has already been occupied in the enumeration of several, the symptoms of which fully establish the fact previously stated, that in general its action is due more to *irritant* than *narcotic* properties; and that when the symptoms of both occur, the *latter* are generally subsequent to the *former*, the only case on record of an action on the nervous system preceding the irritant effects being the one which I have last adduced.

Treatment of Cases of Poisoning.—M. Bouchardât[2] has recommended the use of iodurettted water in such cases. It is a weak preparation of the *Liquor Iodidi Potassii compositus* of the London Pharmacopœia, and is prepared by dissolving six grains of iodide of potassium and three grains of iodine in a pint of water.[3]

Not having been able to procure M. Bouchardât's original paper on the subject, I am ignorant of the principle on which he recommends its use. In the eleventh case of poisoning which I have recorded, and in which the iodurettted water was employed, it seems to have been of no use whatever.

The proper treatment in cases of poisoning by COLCHICUM consists in promoting evacuations upwards and downwards to expel the remains of the poison, and then uniting large opiates with

[1] Scilling—Medizin. Annalen.—Monthly Journal of Medical Science, 1842.
[2] Bouchardât—Gazette Médicale de Paris, Janvier 1837.
[3] London Medical Gazette, 13th April 1849—*Note.*

counter-irritation of the abdomen, or the application of leeches. (Christison.)

THERAPEUTIC ACTION OF COLCHICUM.

I.—As a *Diuretic*. In 1763, Baron Stoërk,[1] of Vienna, first introduced COLCHICUM as a diuretic; and in a book which he published shortly afterwards, numerous cases cured by the use of COLCHICUM were recorded by him.

He relates two cases of *Dropsy* succeeding to *Scarlatina*, which were completely cured in fourteen days; and a case of *Asthma* and *Ascites* in an old man, both of which diseases were entirely removed in a week. The preparation which he used was the *Oxymel Colchici;* and he directs a drachm to be taken for a dose, this quantity being gradually increased to two ounces daily.

He briefly states the physiological action of COLCHICUM, according to his own observations, in the following sentence:—"It dissolves phlegm, and increases expectoration and urine."

It were needless to occupy space by enumerating more of the cases which were published by Stoërk; but having, in justice to him as the original introducer of COLCHICUM, noticed some of them, I may state, that although considered a great physician, the Baron cannot be regarded as a correct reporter of his own cases; for his contemporary Haen[2] says, that "out of thirty-six cases of cancer reported by Stoërk to have been cured by the use of hemlock, it was found on inquiry, that thirty of them had died, and that the remaining six still laboured under the disease."

Thus, although we can place little reliance upon Stoërk's cases, there can be no doubt, from the subsequent confirmation of experience, that there was good foundation for much that he stated. Notwithstanding the exaggerations imputed to him, Stoërk has at all events the merit of bringing into notice many medicines which have since found places in our pharmacopœias, and which, in many instances, have proved valuable additions to the Materia Medica.

M. Planchon[3] mentions several cases occurring in his practice, in which asthma, hydrothorax, ascites, and anasarca were completely removed by the use of COLCHICUM.

At the present time COLCHICUM, I believe, is little employed as a *diuretic*, as there is hardly any mention of it made in the works of authors of the present day.

Dr Mason Good[4] says that it is useful in dropsy, and that it

[1] Stoërk, de Colchico, 1763.
[2] Haen—Epistola de Cicuta.
[3] Planchon—Journal de Médecine, 1765.
[4] Good—Study of Medicine.

ought to rank next to *Squill* as a diuretic in that disease. He exaggerates the acrid properties of the drug, however, in the following passage:—"Even while cutting the roots, the acrid vapour that escapes irritates the nostrils and fauces; and the substance held in the fingers, or applied to the tip of the tongue, so completely exhausts the sensorial power, that a numbness or torpitude is produced in either organ, and continues for a long time afterwards." It is needless to say that there is not the least foundation for such averments.

Dr Craigie,[1] one of the few who mention its use in dropsies, states that it is uncertain in its effects.

That it has diuretic properties, however, is undoubted; and its power of causing increased secretion of urea seems to point it out as a proper stimulant to the kidneys, in cases of suppression of urine, when a fatal result from accumulation of urea in the blood is always to be apprehended.

In the case of a boy, who had almost complete suppression of urine for three days, the whole quantity passed in that time not exceeding an ounce in all, and where digitalis, spiritus etheris nitrici, acetate of potass, and diluents, had produced no effect, Dr Douglas Maclagan used the *Acetum Colchici* with complete success.

"In the acute states of dropsy it is best given with mercurials in powder; but in asthenic cases, it is most advantageously combined with the warmer diuretics, with tonic infusions, with preparations containing camphor or ammonia, or with large doses of the alkaline subcarbonates, particularly in the gouty or rheumatic diathesis." (Copland.)[2]

In *Dropsy* succeeding to *Scarlatina* I have frequently found Colchicum of much service, especially in cases where the urine is much suppressed, and where comatose symptoms are present. The accession of *Coma* may easily be ascribed to the accumulation of *Urea* in the blood; and the power which it has been shown that Colchicum possesses of replacing the *Urea* in natural, and often superabundant, amount in the urine, seems to point it out as a useful remedy in this and other diseases in which *Suppression of Urine* and *Coma* co-exist. In a case of scarlatina which I attended along with my friend Dr A. Christison, now of the H.E.I.C. Service, and where the urine was totally suppressed, and the symptoms of coma were present, the *Acetic Extract of Colchicum* was used with complete success. Diluents and ordinary diuretics were freely employed when the case was first seen, with the effect of causing a slight secretion of urine of low specific gravity. Having suggested that Colchicum might

[1] Craigie—Practice of Physic.
[2] Copland—Dictionary of Practica Medicine—*Dropsy*.

be found of some service, and being anxious to observe its effects, both as a diuretic and as an eliminator of urea, I examined the urine before its exhibition. The results were as follows:—

Urine examined on 10th April.

Total solids, ...	35·795
Urea, ...	2·427
Uric acid, ...	a trace.
Inorganic salts, ...	13·510
Organic matter and water, ...	969·573
Albumen, ...	14·490
Total, ...	1000·000

The *Acetic Extract of Colchicum* was ordered on the 11th April, and the other medicines discontinued. On the 12th, the comatose symptoms were considerably abated; urine, of a normal density, was passed in tolerable quantity, and was examined again on the 13th, two days after the exhibition of Colchicum. It contained:—

Total solids, ...	30·659
Urea, ...	7·500
Uric acid, ...	0·480
Inorganic salts, ...	8·718
Organic matter and water, ...	975·359
Albumen, ...	7·943
Total, ...	1000·000

On the evening of the 14th, the comatose symptoms disappeared; urine, of normal density, was passed in proper quantity; the dropsical effusion and anasarca completely gone. On the 15th, considerable diarrhœa had set in; the Colchicum was stopped, and the urine again examined. It contained:—

Total solids, ...	27·972
Urea, ...	13·573
Uric acid, ...	0·814
Inorganic salts, ...	7·431
Organic matter and water, ...	978·182
Total, ...	1000·000

The analyses of the urine in this case will show the powerful influence which Colchicum possesses in altering the renal secretion, and of how much service, as a remedy, it may be in cases of threatened poisoning by *Urea* in the blood. I believe, in all cases where *Albumen* and *Urea* appear to be vicarious, and where *Coma* supervenes, evidently from the accumulation of the latter principle in the blood, that Colchicum will prove to others of as great service as it has already done in the small experience I have had of it.

Two other cases of a similar nature, in which the urine was examined at regular intervals, were treated in the same manner as that which I have related, with precisely the same result.

II.—As a *Sedative*. In 1820, Mr Haden[1] published a small pamphlet upon COLCHICUM, and especially takes notice of its sedative effects on inflammation.

Mr Haden states, "that in pure inflammation, if it be given so as to produce full purgative effects, COLCHICUM will be found to bring the pulse nearly to its natural state, from being either quick, or hard, or slow and full; but this action may also be produced before purging has taken place. Fevers and inflammations so removed never require the use of tonics during convalescence: the patients, indeed, generally appear to be as well as though they had never been the subjects of disease; and although it sometimes happens that a recurrence of symptoms takes place, it is in a much milder degree, and the new disorder is always immediately removed in the course of a few hours by a very little of the same treatment."

Mr Haden found that the *Tincture of Colchicum* often did not produce purgative effects until forty-eight hours had elapsed, and then it was frequently very violent in its action; with the combination of a saline aperient, however, he found that the beneficial sedative effects of Colchicum followed more quickly and were equally decided as when Colchicum was given alone. Having repeatedly found that very violent effects were produced by the *tincture*, he chiefly made use of the *powder* of the *bulbs*, which he extensively employed in a variety of diseases, the principal of which were Acute Rheumatism, Inflammatory Fevers, Inflammation of Lungs, Pleura, and Bronchi, and in Puerperal Fever. He gives numerous cases in which Colchicum was administered in the form of powder, combined generally with a saline aperient.

The following is a case of *Acute Rheumatism*:—

"A stout labourer was suddenly seized with rigors, after working for several hours in the river Derwent; violent fever followed; and the next day he was confined to bed, being incapable of moving his limbs in the slightest degree. Five grains of powdered Colchicum, with a scruple of Sulphate of Potass, were given four times a-day; and two days afterwards he was found walking in the streets, and was soon quite well. Five doses of the medicine were taken."

The next two cases are of *Lumbago*, treated in the same manner:—

"Two patients, about the same age, were unable to rise from their beds, on account of Lumbago. One of them, a gentleman, in addition to taking COLCHICUM, drank plentifully of warm fluids, took the warm bath twice a-day, and kept himself covered by the bed-clothes; he was quite free from pain in twenty-four hours, and was up and quite well in four days;—whilst the other, a lady, although she remained in bed, and the disease left her perfectly well in a week, yet did not use the warm bath, nor any other of the means used by the other patient. In neither of these cases were tonics required."

[1] Haden on Colchicum. 1820.

These last cases do not prove so much in favour of COLCHICUM as in favour of the warm bath and diaphoretic treatment. In the former of the two cases, where these were used along with Colchicum, the relief was rapid, but by no means unusually so; in the latter, where no warm bath was used, the disease lasted longer under the use of Colchicum alone.

It is remarkable that Mr Haden should have been so successful in his use of the powder of the bulb,—a preparation seldom used by other practitioners; but he seems to have employed it, not as being more active, but as being less irregular, than the tincture in its action. His statements, if confirmed, would lead us to esteem it as a remedy of remarkable antiphlogistic powers; but few practitioners are inclined to believe that it will ever supersede the use of the lancet, and other safer antiphlogistic remedies, in cases of pure inflammation.

He gives one case of *Pneumonia*, in which Colchicum was used with perfect success, instead of blood-letting; but nothing appears in his narrative to show that it has any advantage over tartrate of antimony, which is more manageable, and less likely to produce unpleasant effects.

Mr Haden has, towards the end of his work, expressed his opinion of the action of COLCHICUM in the following terms:—"The sensible effects of Colchicum would appear to be, to control the action of the heart and arteries, and indeed often to reduce that action below that of the standard of health. This effect is often produced long before its other sensible effects are apparent; but when continued long enough, and generally before its remedial virtues are decidedly obtained, purging takes place. Sickness and vomiting accompany the purging in some instances, whilst in others the secretion from the kidneys or from the skin is increased, sometimes without the former symptoms being perceived."

We thus find from Mr Haden's observations, that he considered the action of Colchicum essentially sedative, whilst the purgative and diuretic effects were only incidental accompaniments. This statement of the powers of Colchicum as a sedative is certainly over-rated, and its influence in this respect has not been realised to such an extent in the present day.

Dr Copland[1] says, that the kinds of inflammation in which Colchicum may be of essential service are those cases in which a torpid and obstructed state of the liver is present, and then Colchicum, combined with deobstruent purgatives, is of much use. "In cases attended by very acute pain, or by the effusion of fluids from the inflamed part, it will also be of service, when judiciously combined with other means; but its action should be carefully watched, as in some constitutions it produces most depressing and even injurious effects."

[1] Copland—Dictionary of Practical Medicine: *Inflammation—Heart.*

"The sedative influence of Colchicum on the circulation is also shown in cases of preternatural action of the heart, whether from functional or organic causes."

Dr Lewins[1] says,—"In all inflammatory affections of the chest, and perhaps of the brain, or its investing membranes, I am convinced that bleeding may frequently be, to a certain extent, superseded by the use of Colchicum. In many diseases of the heart and large arteries it is a most valuable medicine."

This, however, I believe to be an exaggeration of the extent to which Colchicum is applicable in inflammatory diseases.

In *Fever*. The same author has recorded six cases of Continued Fever, in which COLCHICUM was used with complete success. In all of these considerable physiological action was manifested, such as vomiting, purging, and reduction of the pulse. These, however, are, generally speaking, very unsafe results in fever.

Dr Tait[2] has noticed thirty-five cases of *Scarlatina*, successfully treated with COLCHICUM. In a few cases vomiting was induced, and a considerable quantity of bile evacuated. In most cases diarrhœa followed its use, but the most apparent phenomena were great reduction of the pulse in frequency and force, and subsidence of the palpitation of the heart, which in young subjects was often apparent to the eye. Dr Tait's cases were all of the purely inflammatory type.

Dr Lewins,[3] jun., has seen cases of *Scarlatina* effectually cured by the administration of COLCHICUM. He says,—"In every instance where Colchicum was employed, the malady very speedily proceeded to a very favourable termination; while other cases, apparently similar in their character, in which this medicine was not administered, proved by no means so satisfactory,—several having terminated fatally, and the sequelæ of others being exceedingly troublesome."

III.—As a *Diaphoretic*. COLCHICUM is now never employed merely to produce diaphoresis, although there can be little doubt that its influence in this respect is by no means inconsiderable, sweating being very often mentioned as having supervened in cases which have been treated by COLCHICUM.

When COLCHICUM is used in combination with OPIUM, sweating is frequently produced, and is often copious. The effect here is not to be ascribed solely to the Colchicum, nor is it always proportionate to the dose of Opium, but is probably due partially to both. Probably its good effects in some cases of *Rheumatism* are partially due to this diaphoretic action, and the combination of Colchicum and Opium, appears in many respects to resemble Dover's Powder in its physiological and therapeutic action.

[1] Lewins—Edinburgh Medical and Surgical Journal, xlvii.
[2] Tait—Lancet, 1837-38, vol. i.
[3] R. Lewins—Edin. Med. and Surg. Journal, vol. lvi.

The two diseases in which COLCHICUM is now more generally employed, are GOUT and RHEUMATISM. Its effects in these two diseases have not been decidedly referred to any one of its physiological actions, but have often been considered as being of a specific character. Instead, therefore, of attempting to refer it to any of the above divisions, it will be better to give its action in Gout and Rheumatism a separate consideration.

IV.—In *Gout* and *Rheumatism*. If we are to believe that the *Eau médicinale* has for its basis some preparation of COLCHICUM, we must assign to Dr Jones, of London, the merit of having first employed the drug in this country for the cure of Gout and Rheumatism. On the other hand, if we are to believe that the Eau médicinale does not contain COLCHICUM, to Sir Everard Home this merit belongs, he having been the first to use COLCHICUM in this country under its own proper designation. As I believe, however, that the former of these opinions is the correct one, it demands a notice of the introduction of this nostrum into Britain, and its subsequent use there.

In 1810, Dr Edwin Jones,[1] of London, first introduced the *Eau médicinale* into this country from France; and in a small pamphlet which he published in that year, he relates several cases in which he used the new drug with great benefit. He states the following to be its mode of action:—"In four or five hours after taking the remedy, the patient begins, however severe the paroxysm may be, to experience a diminution of pain; he generally falls into a quiet sleep, and awakes in the morning nearly or quite free from suffering, and often begins to enjoy some returning use of the affected limb; he then commonly feels considerable nausea, sometimes accompanied by vomiting, and generally followed by bilious stools; in the meantime the paroxysm diminishes, and on the third, or even the second day, nothing remains but a slight swelling or stiffness of the parts, which soon goes off, leaving the patient in his usual state of health. These are the common effects," says Dr Jones, "but there are others no less singular and deserving attention. Together with a diminution of pain, there is an abatement of fever and irritation; the pulse is often reduced twenty strokes in a minute, and in many instances considerably more; at the same time a moderate diaphoresis usually takes place. It very frequently also acts as a powerful diuretic, and its operation in this way sometimes lasts for several days."

Though the paroxysm was removed in the majority of his cases in the above manner, Dr Jones observed that the time in which this was effected varied under different circumstances. Sometimes a patient gets rid of a sharp fit the next day; in others, several days may be necessary. "In its action on the bowels, the Eau médi-

[1] Jones on Gout. 1810.

cinale is extremely capricious; it usually operates in the way above-described, sometimes it produces no evacuation at all; in others it proves powerfully emetic and cathartic; and in a few cases has acted with considerable violence." These variations in action did not appear to depend on the relative strength of the patients, as Dr Jones observed that several weak and delicate persons took full doses, without experiencing any disturbance, whilst in some robust habits it acted powerfully both by vomiting and by stool, although only half a dose was taken. This appears rather to be referable to some peculiarity of constitution. It was equally uncertain in the time required to produce these effects. It generally began to operate in eight or ten hours after being taken, sometimes not till twenty-four or forty-eight hours had elapsed, and in some rare cases not till after three days. Dr Jones concludes his remarks on the action of this medicine by stating, that "for the most part the Eau médicinale, even where it has been more violent than was expected, has not been followed by any ill consequences."

In 1815, Mr Want[1] published his conviction of the identity of the basis of the *Eau médicinale* and COLCHICUM. He successively used the menstrua of proof-spirit, wine, and water, and succeeded in forming a preparation with Spanish wine, differing in no respect from the Eau médicinale. I believe Mr Want to have been the first person to draw attention to the probable identity of these two medicines.

The publication of this paper by Mr Want paved the way for a controversy between him and Dr Sutton,[2] the latter of whom very much doubted that Mr Want had discovered the plant whose active properties were the basis of the French nostrum, and he endeavoured to show that Mr Want had only reported cases cured by a medicine well known at the time, and that the power of this remedy merely consisted in its cathartic properties, and stated that many purgatives then known would have the same effect; but Mr Want disproved this in a subsequent paper, in which he published a case of Gout, cured by Colchicum, in which no purging had been induced.

In 1816, Sir Everard Home[3] and Sir Charles Scudamore[4] both wrote upon Gout, the former advocating the identity of the Eau médicinale with Colchicum, the latter denying it. Sir E. Home quotes himself as a case in which the Eau médicinale had acted powerfully and effectually in restraining the gouty paroxysm.

Under the influence of a violent fit of Gout, Sir Everard took sixty drops of the *Eau médicinale*. The pain was intense, and he felt chill; in two hours he became rather hot and thirsty; in three

[1] Want—Medical and Physical Journal, vol. xxxii.
[2] Sutton on Gout.
[3] Home—Philosophical Transactions, 1816-17, Part 2.
[4] Scudamore on Gout and Gravel. 1816.

hours the pain was considerably diminished; in seven hours he had a confirmed motion of the bowels; nausea came on, and the pulse, naturally at 80, lowered to 60, and intermitted. In ten hours the nausea had gone off, he remained languid, his pulse was 70; he had some appetite. The following morning the pulse was 80, and he was quite well.

Sixty drops of the *Vinum Colchici* were given to a man labouring under Gout, and whose paroxysms were generally of three or four weeks' duration. His age was sixty. When the medicine was exhibited, his pulse was 115. In half an hour he had slight nausea, which soon went off. In five hours a profuse perspiration came on, and the pain of the Gout entirely ceased, leaving a soreness in the part affected. In twelve hours his bowels were gently moved, his pulse 105, and irregular. In fourteen hours his bowels were again acted on. In nineteen hours his pulse was 92, and natural. In forty-eight hours he was quite well, and continued so.

From his observations on the use of Colchicum in Gout, Sir Everard Home concluded, that the effects of the remedy always were to reduce the pulse ten or twenty beats in a minute, and that this effect generally took place about twelve hours after the administration of the medicine.

Sir Charles Scudamore denies that the basis of the *Eau médicinale* and COLCHICUM are identical, and he gives his opinion, that the Eau médicinale is a dangerous remedy, and one which has been much too highly praised by Mr Want; he, however, does not deny that it has some influence over Gout, as he states that on the first trial of the medicine the paroxysm is removed, and that as if by a charm, and that relief is often obtained without any sensible effects upon the stomach or excreting organs, and that the curative power of the remedy lessens gradually on repetition, and with many persons becomes entirely lost. The capricious action of this medicine seems to him to be the chief objection to its use. He states a case in which the patient had taken several bottles in a few weeks, without any effect being produced; and another, where the contents of a single bottle so paralysed the stomach, that for many days it was scarcely sensible to the strongest stimulants; the patient was recovered with much difficulty, and remained for a long time in a state of serious debility. He says,—"When the Eau médicinale does not immediately debilitate by the violence of its effects, it often leaves behind an impaired condition of the nervous system, as, that the head is affected with frequent giddiness; the stomach with weakened digestive power, and frequent sensations of sinking and vacuity; the limbs, and especially the parts affected in the paroxysm, suffer for many weeks with trembling, numbness, and coldness, and very commonly with tedious œdema; these symptoms appearing variously in different individuals. It tends also to render the bowels inactive, to diminish the alimentary secretions, and ma-

terially to weaken the functions of the liver. In the general character of the medicine, it may with truth be said, that sooner or later, in proportion as it is freely employed, it leads to a broken state of health."

Mr Ring[1] relates a case of poisoning by the *Eau médicinale*, in a person who had been accustomed to use it for the relief of Gout. Half a bottle was taken; it operated violently as an emetic, cathartic, and sudorific. Next day the Gout had disappeared, but a violent pain had seized the patient in the pit of the stomach; this increased during the night, when it became excessive, alternately affecting the stomach and bowels. On the second day the pain gradually abated; but in the evening bilious vomiting came on; and on the third day he died.

These effects observed in the *Eau médicinale* show it to have been a preparation very analogous to COLCHICUM in its general effects; but its uncertainty and violence correspond more with the accounts which are generally given of the action of *Veratrum Album*, and it is not improbable that it may have contained the active part of both these drugs.

In modern practice, however, the *Eau médicinale* has been completely superseded by the ordinary officinal preparations of Colchicum, and the little bottles in which it was sold are rarely met with, except as preparations in a museum.

There can be no doubt, from the results of modern experience, of the value of COLCHICUM as a remedy in cases of Gout; but, as I have had no opportunity of treating cases of that disease, it cannot be expected that I should offer remarks on the practical employment of any medicine for its cure. I must therefore rest satisfied with briefly reporting the experience of practical men.

1. In *Gout*. It appears probable, that COLCHICUM, in the form of *Hermodactyl*, was employed even in ancient times in the cure of Gout—now it is in very general use.

Its action is very frequently said to be specific, but, as has been previously remarked, this expression seems to imply nothing more than that its effects are energetic and marked; for the term "specific," as applied to a medicine, in strict propriety means one which cures a disease, without producing any distinct or obvious physiological action, in virtue of which it may be supposed to lead to the cure of the disorder; but it appears, from the concurrent testimony of many practical men, that Colchicum seldom cures the paroxysm of Gout, without producing some distinct physiological action. To use the words of Dr Barlow,[2]—"A full dose of this medicine purges copiously, allays pain, and lowers the pulse; its operation seems to

[1] Ring—Edin. Med. and Surg. Journal, vol. vii.
[2] Barlow—Cyclopædia of Practical Medicine—*Gout*.

combine the several advantages of blood-letting, purging, and the production of sedative action."

Dr Christison[1] has stated, that COLCHICUM seldom acts therapeutically before producing a slight degree of that physiological action indicated by diarrhœa, colic pains, and frontal headache, which, in a higher degree, constitutes it a poison.

Dr Gairdner,[2] however, states, that he believes the action of COLCHICUM to be *specific*, and denies the necessity of its producing any physiological effects before relief is obtained. To use his own words,—"COLCHICUM never more effectually relieves the patient than when it acts silently and peacefully, without producing any evacuation whatever, or in any way disturbing the patient's comfort and ease."

The rarity of the occurrence of Gout here has prevented me from deciding, by means of statistics or otherwise, whether or not it is necessary that some physiological action should accompany the therapeutic effect of this drug. I have found means of doing so, however, with regard to Rheumatism, to the results of which inquiry I shall immediately refer.

Dr Robertson[3] states, that while COLCHICUM acts freely on the bowels, and especially on the duodenum, it possesses a specific action on the white fibrous tissues; it is to this property, he says, that COLCHICUM owes its power over Gout, Rheumatism, and certain affections of the heart, and every disease involving febrile or inflammatory excitements, quite independently of its other effects on the system.

Dr Todd[4] states with regard to Gout, what Dr M'Leod[5] does with regard to Rheumatism, that whenever nausea or purging are induced during the administration of Colchicum in those diseases, the dose of the medicine should be diminished, or altogether abandoned.

It has frequently been objected to the use of COLCHICUM, that it confirms the Gouty constitution in the systems of those who have used it. As Gout generally occurs in persons who have the disease confirmed in their constitutions, either by having inherited it, or by having acquired it by full living, &c., Colchicum has got the credit of confirming the Gout in their systems, when that is in reality due to the inherited or acquired Gouty habit.

With regard to this, Dr Holland[6] writes,—"A suspicion has existed that, though capable of relieving the present paroxysm, Colchicum renders the attacks of the disorder more frequent. On my experience, I believe this opinion to be justified only where the

[1] Christison's Dispensatory.
[2] Gairdner on Gout. 1849.
[3] Robertson on Gout.
[4] Todd on Gout and Rheumatism.
[5] M'Leod on Rheumatism.
[6] Holland's Medical Notes and Reflections. 1840.

medicine has been used imperfectly, or without other precautions, which are more or less essential to its success."

On the other hand, Dr Copland[1] says,—"COLCHICUM, when used with the view of preventing or suddenly curing the paroxysm, and without reference to the removal of the morbid condition of which it is the external manifestation, is liable to many objections. The consequences of having frequent recourse to it vary in different constitutions, and with the habits and mode of living of the patient, but they commonly are a much more frequent return of the fit, or of the symptoms indicating its approach; impaired nervous power; debility of the digestive organs; torpor and irregularity of the biliary functions, and of the bowels; headaches, and a variety of symptoms referable to the encephalon." Besides this, he has met with instances of Hypochondriasis, Melancholia, Mental Delusions amounting to Insanity, Paralysis, and Angina Pectoris, evidently arising from this.

Were all physicians agreed upon this point, COLCHICUM would require to be considered in a far different light from that in which it is at present. Few men have met with such untoward results in the use of this medicine as Dr Copland, and we should believe, at least hope, that they are considerably exaggerated.

With regard to the application of COLCHICUM for the relief of the morbid conditions of which Gout consists, besides its use for the mere alleviation or prevention of the paroxysm, Dr Robertson[2] states, that "the action of Colchicum must be said to be more decided and greater on the local manifestation of Gout, and the inflammatory character of its paroxysms, than on the constitutional condition on which Gout depends, and of which the localised ailment is only a form and development."

Dr Holland,[3] however, is more favourable to its further application. He says:—"I can scarcely doubt the expediency of carrying the employment of COLCHICUM beyond the mere relief to the local inflammation of the disease. The remedy, with due care, may be made preventive as well as curative of Gout, and, according to my experience, with no less safety to the patient.

"We may reasonably, then, if this view be just, extend to its use as a medicine the remark before made,—that too exclusive attention is given to the external part of the disease, and the value of the remedy, in the constitutional form of the disorder, too little regarded. Larger experience is making a gradual change in this respect; but there is still a tardiness and timidity in its application beyond the mere fit of Gout, which is not warranted by any ascertained risk."

I offer no further remarks here, both on account of the various opinions of high testimony I have adduced, and also from the fact

[1] Copland—op. cit.: Treatment of Gout.
[2] Robertson—op. cit.
[3] Holland—op. cit.

previously stated, that the rare occurrence of Gout in this place has prevented my making observations on the nature and treatment of the disease.

Besides its actions before stated, COLCHICUM appears to act both as a diuretic and diaphoretic. Its principal action appears, however, to be, lowering the pulse and relieving pain, and therefore its chief object is that of a sedative and anodyne.

Bearing in mind, however, the tendency to the formation of *Lithic Acid* in Gouty subjects, and the effect of Colchicum in altering the renal secretion, it seems more than likely that its effects are partly due to changes which it induces in the chemical quality of the blood, and the secretions derived from it.

All the preparations of COLCHICUM have been employed in Gout and Rheumatism, and have been administered in various ways. Dr Watson[1] recommends forty to sixty minims of the *Vinum Colchici* in a saline draught at bed-time, and a half drachm more in a warm black dose the next morning. More commonly, however, the simple tincture of the seeds is employed. This is recommended by Dr Barlow[2] as being more uniform in strength, and more certain in operation.

It may be administered in full doses (*i. e.*, twenty to thirty minims), and repeated at intervals till the pain has abated, or till some of its physiological actions, such as purging or diuresis, manifest themselves.

2. In *Rheumatism*. COLCHICUM has been employed upon much the same principle as in Gout, and from the similarity of the two diseases we would be led to expect much the same results from its use. It does not appear that its curative powers are in general manifested, until it has fairly produced some of its constitutional effects; and when these are fairly shown, as, for example, when it produces some amount of irritation of the bowels, the disease frequently yields with great rapidity. In Dr Watson's words,—"The preparations of COLCHICUM have sometimes, whether venesection has been premised or not, an almost magical effect in quelling the disease. Frequently when most successful (though that is by no means a necessary condition of their success), they exercise some marked influence upon the stomach and bowels. Colchicum is very apt to occasion deadly nausea and vomiting, griping and diarrhœa, and when these consequences ensue from its use, the inflammation of the joints often subsides entirely. At any rate, if the Rheumatism does not give way, when the stomach and bowels become thus affected, you may be certain that to push the Colchicum further would be useless."

In an interesting memoir, Dr E. Monneret[3] gives the details of

[1] Watson's Practice of Physic.
[2] Barlow—op. cit.
[3] Monneret—Archives Générales de Médecine, Mars 1844. London Medical Gazette, vol. xxxiv.

treatment of twenty-five cases of *Articular Rheumatism* treated by COLCHICUM. The greater number of his patients took from one to four drachms of the tincture, in one, two, or four divided doses, in the twenty-four hours. One drachm was the smallest dose of the tincture ever administered, and several of his patients took it for seven, some for ten, and others for thirteen, days. In eight of the patients the diminution, or even total disappearance, of the symptoms of Rheumatism coincided with the exhibition of Colchicum. In these cases, the disease was either of some days' duration, and was scarcely accompanied by febrile symptoms, and then ended in twelve or fourteen days, or it was completely chronic.

In either case, the powerful effects produced by the Colchicum on the bowels sufficed to suspend or expel the disease; the improvement always coincided with the diarrhœa. In most instances, diarrhœa was the prevailing feature, although in some cases retching and vomiting, without any purging, were induced. The discharges were almost always bilious, or evidently mixed with bile. The motions were usually passed with acute suffering, violent colic pains, tenesmus, and scalding of the anus. Vomiting was scarcely induced by a smaller dose of the tincture than from two to four drachms in a draught.

In order to corroborate the idea that COLCHICUM in general produces some physiological effect, before its therapeutical action is manifested, I have prepared the following table of cases of *Rheumatism* treated by Colchicum, in which will be seen the effects of this medicine in seventeen cases.

This must necessarily be more or less imperfect, from the incomplete manner in which the cases have been reported; still it is sufficiently correct to show, that the physiological effects of COLCHICUM are the almost certain accompaniments of its therapeutic action; and it would thus appear that in *Acute Rheumatism*, COLCHICUM produces its good effects, partly by its *evacuant*, and partly by its *sedative* influence.

Beyond this, however, I believe that Colchicum exerts a great influence in the treatment of this disease by the power it has of altering the renal secretion.

In *Acute Rheumatism*, Dr Garrod[1] states, that the blood contains no more *Uric Acid* than in health; this being a very minute quantity. I am inclined to believe, however, that in all cases of *Acute Rheumatism*, both *Urea* and *Uric Acid* are present in the blood in increased quantity.

[1] Garrod—Lond. Med.-Chir. Trans., vol. xxxi.

TABLE OF CASES OF RHEUMATISM TREATED WITH COLCHICUM.

No.	Age.	Sex.	Variety, and parts affected by Rheumatism.	Pulse before treatment.	Previous duration of disease.	Duration of treatment.	Treatment.	Physiological action.	Pulse after treatment.
1	58	M	Articular. Lower extremities.	78	12 Days.[a]	10 Days.	Colchicum Powder. ...	Diarrhœa, nausea.	Natural
2	40	M	Muscular, and Articular of Knees.	60	5 Months.[a]	17 Days.	Colchicum and Dover's Powder.	Griping, nausea.	Natural
3	29	F	Articular. Upper extremities.	—	3 Weeks.[a]	16 Days.	Colchicum Powder. ...	Diarrhœa. ...	—
4	70	M	Articular.	80	6 Months.[a]	11 Days.	Colch., Morph., Iodid. Potass.	Nausea, diarrhœa.	Natural
5	32	M	Articular.	100	4 Days.[a]	4 Days.	Colchicum, Morphia. ...	Diarrhœa. ...	65
6	17	F	Articular.	96	14 Days.[a]	2 Months.	Colchicum, Morphia. ...	Diaphoresis, nausea	80
7	20	F	Articular. Ankles and wrists.	100	8 Days.[a]	4 Days.	Colchicum, Morphia. ...	Profuse diaphoresis	86
8	22	F	Articular. Knee and wrist.	120	8 Days.[b]	13 Days.	Colchicum, Magnesia.	Diarrhœa. ...	60
9	—	M	Articular. Wrists.	72	21 Days.[b]	12 Days.	Colchicum, Magnesia.	Diarrhœa. ...	54
10	18	M	Articular. All joints, more or less.	120	35 Days.[b]	17 Days.	Colchicum, Magnesia.	Diarrhœa. ...	60
11	—	F	Articular.	—	4 Months[c]	14 Days.	Vin. Colchici, V.S. ...	Diarrhœa. ...	—
12	—	M	Articular.	—	49 Days.[c]	14 Days.	Vin. Colchici, Leeches.	Diarrhœa. ...	—
13	—	M	Articular.	—	14 Days.[c]	14 Days.	Vin. Colchici, Cupping.	Diarrhœa. ...	—
14	—	M	Rheumatic Fever.	—	6 Days.[c]	3 Days.	Vin. Colchici, Opium.	Diarrhœa. ...	—
15	28	F	Articular. Elbows, wrists, hand.	—	3 Months.[d]	14 Days.	Vin. and Acet. Extr. Colchici.	Vomiting. ...	—
16	30	M	Articular. All large joints.	—	12 Days.[e]	6 Days.	Tinct. Colchici.	Profuse diaphoresis	—
17	30	M	Articular, Metastatic. Knees, elbows.	130	14 Days.[f]	18 Days.	Tinct. Colchici, Morphia.	Diarrhœa, diaphor.	100

[a] From the Journals of Royal Infirmary, Edinburgh.
[b] Tweedie—London Med. Gaz., vol. viii.
[c] Elliotson—London Med. Gaz., vol. viii.
[d] Seymour—London Med. Gaz., vol. xviii.
[e] Duke—Medical Transactions, 1830.
[f] Personal observation.

In the cases which I am about to relate, and which fell under my own observation, I shall endeavour to prove that such is the case, and to show, from the analysis of blood and urine, which I made both before and after the exhibition of Colchicum, that the remedial agency of this medicine is due, partly at least, to its power of eliminating Urea and Uric Acid from the blood, and increasing their quantity in the urine.

The first case was that of a girl, under Dr Wright's care, in the Royal Infirmary. On the 13th of October a small quantity of blood was subtracted, analysed, and found to contain :—

In 1000 parts of blood,	... ...	0·507 Urea.
" "	... ...	·864 Uric Acid.

The urine was examined at the same time. It contained :—

Total Solids,	... ...	28·568
Water,	... ...	971·432
Urea,	... ...	10·496
Uric acid,	... ...	·257
Inorganic salts,	... ...	7·461
Organic matter,	... ...	10·354
Total,	... ...	1000·000

Colchicum, in combination with Muriate of Morphia, was then administered.

The urine was again examined on the 18th October, being the fifth day. It was found to contain :—

Total solids,	... ...	31·459
Water,	... ...	968·541
Urea,	... ...	12·312
Uric acid,	... ...	·421
Inorganic salts,	... ...	8·231
Organic matter,	... ...	10·495
Total,	... ...	1000·000

The urine was again examined on the 22d October, or ninth day. It contained :—

Total solids,	... ...	35·613
Water,	... ...	964·387
Urea,	... ...	13·984
Uric acid,	... ...	·598
Inorganic salts,	... ...	9·401
Organic matter,	... ...	11·630
Total,	... ...	1000·000

After twelve days constant use of the Colchicum, a small quantity of blood was procured for examination. Now, however, not the slightest trace either of Urea or Uric Acid could be detected in so large a quantity as 3500 grains.

The urine was examined at the same time, and was found to contain :—

Total solids,	... ...	34·554
Water,	... ...	965·446
Urea,	... ...	14·561
Uric acid,	... ...	·737
Inorganic salts,	... ...	9·649
Organic matter,	... ...	9·607
Total,	... ...	1000·000

The Colchicum being still continued, the urine was again examined on the eighteenth day, and found to contain :—

Total solids,	... ...	38·128
Water	... ...	961·872
Urea,	... ...	17·635
Uric acid,	... ...	1·034
Inorganic salts,	... ...	9·999
Organic matter,	... ...	9·460
Total,	... ...	1000·000

The next case to which I shall refer was treated by myself in the New Town Dispensary. I had only an opportunity of examining the blood in this case once,—namely, before Colchicum was taken. It then contained :—

In 1000 parts,	... ...	1·416 Urea.
"	... ...	·691 Uric acid.

Before taking Colchicum, the urine contained :—

Total solids,	... ...	23·479
Water,	... ...	976·521
Urea,	... ...	6·358
Uric acid,	... ...	·097
Inorganic salts,	... ...	7·333
Organic matter,	... ...	9·691
Total,	... ...	1000·000

The urine was again examined on the fourth, ninth, and thirteenth days respectively, and contained :—

On 4th Day.

Total solids,	... ...	24·538
Water,	... ...	975·462
Urea,	... ...	9·103
Uric acid,	... ...	·231
Inorganic salts,	... ...	8·693
Organic matter,	... ...	6·511
Total,	... ...	1000·000

On 9th Day.

Total solids,	...	26·322
Water,	973·678	
Urea,	12·961	
Uric acid,	·497	
Inorganic salts,	9·400	
Organic matter,	3·444	
Total,	1000·000	

On 13th Day.

Total solids,	...	27·466
Water,	972·534	
Urea,	16·324	
Uric acid,	·936	
Inorganic salts,	7·203	
Organic matter,	2·503	
Total,	1000·000	

These are the analyses of two very favourable cases, in which it will be seen, that the UREA and URIC ACID are increased in proportion to the time that the medicine is continued. I have selected these two cases from many others, on account of their showing the increase more gradually. In all the cases, however, in which I have analysed the urine, the great increase was distinctly marked, although perhaps not in so regular proportion.

One other case I would wish to mention, in which the *Urea* and *Uric Acid*, although they increased after a few days' use of the medicine, did not continue to do so subsequently in the same proportion.

The analyses were made before taking Colchicum, and on the third, sixth, and tenth days after its exhibition :—

Before taking Colchicum.

Total solids,	...	25·636
Water,	974·364	
Urea,	7·634	
Uric acid,	·129	
Inorganic salts,	8·421	
Organic matter,	9·402	
Total,	1000·000	

On 3d Day.

Total solids,	...	27·479
Water,	972·521	
Urea,	11·158	
Uric acid,	·300	
Inorganic salts,	8·303	
Organic matter,	7·718	
Total,	1000·000	

On 6th Day.

Total solids,	...	27·907
Water,	972·093	
Urea,	15·660	
Uric acid,	·570	
Inorganic salts,	6·500	
Organic matter,	5·177	
Total,	1000·000	

On 10th Day.

Total solids,	...	28·426
Water,	971·574	
Urea,	15·730	
Uric acid,	·582	
Inorganic salts,	7·351	
Organic matter,	4·763	
Total,	1000·000	

These analyses will show to what extent COLCHICUM will alter the renal secretion, by supplying it, when deficient of its normal constituents—*Urea* and *Uric Acid*—from the blood.

I am inclined from all this to believe, that to this property of Colchicum its remedial action is in a great measure to be referred. Further analyses of the blood may, however, be thought necessary, but neither time nor opportunity have afforded me means for this purpose. The thirteen analyses of the urine recorded above are only a few selected from many others made by me, and were effected according to Becquerel's method.

COLCHICUM has been employed in all forms of the disease, but it appears to me more particularly useful in *Articular Rheumatism*. In Dr Watson's[1] words, "our wishes and our expectations from Colchicum are often doomed to be defeated. I believe that in proportion as the synovial symptoms predominate, or mix themselves distinctly with the fibrous—in proportion as the disease approaches in its characters to Gout—you may expect to be successful with Colchicum. Large doses are not requisite; twenty minims of the *tincture* or the *wine* may be given every six hours, until some relief is obtained; or a grain of the *inspissated juice*, or of the *acetic* extract of Colchicum, every four hours. Under this treatment the disease sometimes vanishes within three or four days; the medicine producing sickness and purging, and the Rheumatism or the Rheumatic Gout rapidly declining. Occasionally the same favourable event takes place, although there has been no disturbance of the stomach and bowels."

The cases in which Colchicum appears to me to be more preeminently useful are those in which the disease attacks the joints, and is of an erratic character—*e. g.*, suddenly disappearing from one

[1] Watson—op. cit.

joint, and as suddenly appearing in another; these, I believe, are the cases in which the heart and other internal organs are chiefly affected, and probably if the active operation of Colchicum is secured early, these formidable secondary diseases are less likely to occur.

Of the use of Colchicum topically, little need be said. It is reported to have been employed with great success by Dr Gumpert,[1] who records the case of a clergyman, who had been confined to his bed for six weeks with Rheumatism; on the fifth day, after using frictions with the tincture of the seeds, he was enabled to leave it.

Dr Laycock[2] has likewise used it with great success in Gout, Rheumatism, and also venereal pains.

V.—*Use of Colchicum in other diseases.*

1. In cutaneous diseases.—*Urticaria.*[3] In a case of this disease, where the urine was of low specific gravity (1010), and was found on examination to be much deficient in Urea and Uric Acid, Colchicum was employed with complete success. The urine before taking Colchicum was of a pale straw colour, transparent, and left no deposit on standing. It was analysed according to Becquerel's method, and found to contain:—

Urea, ...	6·91
Uric acid, ...	0·05
Inorganic salts, ...	12·03
Organic matter and water, ...	981·01
	1000·00

Colchicum was then administered, and a fortnight after the urine was again examined. Density 1029·9. It was found to contain:—

Urea, ...	20·36
Uric acid, ...	0·50
Inorganic salts, ...	12·72
Organic matter and water, ...	966·42
	1000·00

Here, then, it will be seen that the physiological action of Colchicum was well marked. The *Urea* was more than tripled in its amount, and raised above the normal standard. The increase of *Uric Acid* was in a tenfold ratio, whilst the other organic constituents and water suffered a corresponding diminution, the inorganic salts remaining nearly as before.

In *Prurigo.*[4] Dr Elliotson gives the case of a man, labouring under this disease in its most inveterate form, to whom half a

[1] Gumpert—Revue Médicale—I.
[2] Laycock—London Medical Gazette, vols. xxiii., xxiv.
[3] Monthly Medical Journal. 1846.
[4] Elliotson—Lond. Med.-Chir. Review, vol. vii.

drachm of the Vinum Colchici was administered thrice daily. This the patient took for three weeks; at the end of which time he was completely cured.

Colchicum would thus seem to answer well in some cases of skin diseases where the urine is of low specific gravity.

2. In nervous diseases.—*Hysteria.* Mr Raven[1] details the case of a young woman, who was thrown into strong hysterical convulsions, by seeing the death of a relation. She had been treated by fœtids, volatiles, cathartics, &c., but without relief. She was admitted into hospital under the care of Dr Alderson, who, having lately seen the good effects of Colchicum in severe cases of *Chorea*, was induced to try it on her. Thirty drops of the tincture were taken every eight hours. In a few days the convulsions left her, and did not return. In *Chorea*[2] also Colchicum has been employed with reported benefit. The cases are mentioned of three children having been relieved from this disease in three or four days, by using from ten to twenty minims of the tincture of Colchicum daily.

3. On the *Genito-Urinary System.*—Dr Clutterbuck[3] has seen in Colchicum a peculiar influence over uterine contractions. He administered ten grains of Colchicum in powder to a female in whom the uterus was contracted over the placenta. The dose was repeated, the os uteri dilated, uterine contractions came on, and the placenta was removed in a state of putrefaction.

Dr Metta[4] relates a case of abortion, in which the placenta was retained, and uterine contractions had ceased. Two doses of powdered root of Colchicum, at an interval of half an hour, were prescribed, and soon after uterine contractions came on.

In *Leucorrhœa*, Mr Ritton[5] experienced great benefit from the use of Colchicum in powder. A week or ten days was generally sufficient to complete a cure, the patient being strictly kept from all alcoholic liquors during its exhibition.

In *Gonorrhœa*, Eisenmann,[6] of Berlin, speaks very highly of the results obtained from the use of an opiate wine of Colchicum in this disease. The preparation he uses is composed of three drachms of Colchicum wine and half a drachm of tincture of opium. This is either given in increasing doses, or twenty drops twice daily. The cure is said to be generally complete from the seventh to the fourteenth day.

In *Chordee.*—In a case of *Gonorrhœa*, for which cubebs had been

[1] Raven—London Medical and Physical Journal, vol. xxxvii.
[2] Bibliothèque Médicale, vol. lviii.
[3] Clutterbuck—Mérat et de Lens.—Dictionnaire de Matière Médicale.—Il Filiatre Sebasio, 1843.
[4] Metta—American Journal of the Medical Sciences, vol. viii.
[5] Ritton—Lancet, 1833-34, vol. ii.
[6] Eisenmann—Casper's Wochenschrift, No. xxxv.—Medical Times, 1849.

prescribed, severe chordee supervened. Sir B. Brodie[1] remarked that Colchicum relieved the painful symptoms of chordee better than opium, and had also the effect of restraining sexual desire. He gives a drachm of the wine in one and a half ounces of camphor mixture for a dose.

4. Effects of Colchicum on the *Salivary Glands.*[2] Mention is made of three cases in which profuse ptyalism resulted from the use of *half a drachm* of the tincture of the seeds of Colchicum thrice a-day for some time. In one of these cases, the patient had never been salivated, nor had any mercury ever been taken. They were all cases of ophthalmia.

5. In *Tetanus.*[3] Dr Smith, of Port-au-Prince, employed Colchicum advantageously in tetanus, both traumatic and idiopathic. He gave it in full doses, repeated every half hour, till it produced an emetic or cathartic effect.

6. As an *Anthelmintic* and *Vermifuge.* Dr Pereira[4] states that Chisholm and Baumbach used it successfully in expelling tapeworm; and Mérat et de Lens[5] mention that Bauhin employed it as a vermifuge for pediculi of the head and pubis.

7. As an *Intoxicating agent.*—Chaumeton[6] says that the Turks procure for themselves a kind of ecstatic drunkenness with the Vinum Colchici.

These are merely mentioned as the uses to which Colchicum has been put, as much greater experience than is recorded here would be necessary before we could place much reliance on its power in any of these diseases.

8. In *Cholera Asiatica.*—In 1833, Mr Cotter[7] published a notice of having used Colchicum in Asiatic cholera. His cases are not detailed; and nothing more is remarked, than that he used it with perfect success in all stages of the disease.

No dependence can be placed on statements so vague as this, with regard to the utility of any remedy; nor does it appear easy to understand upon what principles a substance having the physiological action of Colchicum could be expected to be useful, either in the preliminary Diarrhœa or in the stage of Collapse.

The well-known fact, however, that many cholera patients, after having passed from the stage of *Collapse* into that of *Re-action*, continue to be affected with complete *suppression of urine;* that many of these die in a comatose condition, obviously from accumulation of Urea in the blood, naturally point out the employment of *diuretics*, as being indicated in the re-actionary and subsequent stages of the disease, and the power of Colchicum of eliminating that princi-

[1] Brodie—Lancet, 1838-39, vol. ii.
[2] Dublin Hospital Gazette, 1845.—London Medical Gazette, 1845.
[3] Smith—Wood and Bache's United States Dispensatory.
[4] Pereira—Materia Medica.
[5] Mérat et de Lens—Dictionnaire.
[6] Chaumeton—Flore Médicale, vol. iii.
[7] Cotter—Lancet, 1833-34, vol. ii.

ple, seems to indicate it as the form of diuretic most applicable to the occasion.

That the non-existence of urea in the urine, and its accumulation in the blood, are at all events pathological conditions of this morbid state, has been abundantly established.

In 1832, Dr O'Shaughnessy[1] published the case of a female, the *serum* of whose blood contained 1·40 per mille of *Urea;* and in 1849, Dr W. Robertson[2] corroborated this fact, by publishing the details of several analyses of blood, taken from the patients in the Cholera Hospital here. In the same year, Dr James Begbie[3] published several analyses of the urine, by which it was distinctly shown that little or no *Urea* is present in that fluid obtained from cholera patients.

During the late epidemic of cholera in this city (1849), I had a favourable opportunity of observing the action of Colchicum as a diuretic in this disease. In the case of a female, in whom a very small quantity of urine, deficient in urea, was voided, the *Acetum Colchici* was prescribed, and its exhibition was followed by the desired effect upon the urine, and with great benefit to the patient. Other cases occurring in the hospital were not so successful, on account of the accession of diarrhœa.

Two great indications in the treatment of this disease being to increase the amount of urine, when that is deficient, which is almost universally the case, and to aid the elaboration of those principles which it is the province of the kidneys to eliminate, the accumulation of which in the blood we may readily suppose to be the cause of the accession of coma, it appears probable that Colchicum might prove of eminent service, and is at all events well worthy of further trial.

9. In *Bright's Disease.*—A consideration of the physiological action of COLCHICUM,—namely, its diuretic action on the kidney, combined with the property of increasing the elimination of Urea, leads me to suggest the probability of its being found useful in some cases of Bright's disease. This I venture to offer as a mere theoretical speculation, which I have had little opportunity of submitting to the test of experience, and which, so far as I can find, has not been adopted in practice by any of the authors who have written on this subject. It is true that Dr Prout[4] mentions the use of Colchicum in this disease, but only where the gouty diathesis is present. Irrespective of this state, I venture to suggest its employment.

The presence of *Urea* in the blood appears to be one of the established phenomena in the advanced stages of Bright's disease.

In 1829, Dr Bostock suggested that *Urea* being deficient in the *Urine* of patients labouring under Bright's disease, might be detected in the *Blood.* He accordingly "sought for it in the serosity of

[1] O'Shaughnessy—Chemical Pathology of Asiatic Cholera, 1832.
[2] W. Robertson—Monthly Medical Journal, 1849.
[3] James W. Begbie on the Urine in Cholera, 1849.
[4] Prout on Stomach and Renal Diseases.

several of Dr Bright's patients, but could detect only a matter possessing peculiar properties, which seemed to approach to those of Urea.[1]

In the same year, Dr Christison[2] first detected this principle in the serum of the blood in several cases of Bright's disease. One case which he relates is as follows:—

The urine in this case, although not greater in quantity than natural, contained only a fifth of the normal proportion of *Urea*. The action of nitric acid on the extract of serum produced a beautiful radiated mass of foliaceous pearly crystals of *Nitrate* of *Urea*.

In 1840, Dr G. Owen Rees[3] published a statement of his analyses of the blood of patients labouring under Bright's disease, showing a diminution in the amount of *Albumen*, and an abnormal quantity of *Urea* in the blood.

The following are his analyses:—

(1.) Serum—Sp. gr. 1015—Contained in 1000 grains,—

Albumen, ...	46·980 grains.
Urea, ...	0·209 —

(2.) Serum—Sp. gr. 1025—Contained in 1000 grains,—

Water, ...	904·20
Albumen, ...	65·00
Extractive and salts, ...	30·30
Urea, ...	0·50
	1000·00

(3.) Serum—Sp. gr. 1029, or natural—Contained in 1000 parts,—

Water, ...	896·6
Albumen, ...	81·6
Extractive and salts, ...	21·3
Urea, ...	0·5
	1000·0

In the first two cases there is a deficiency of *Albumen;* in the last case, although the albumen is normal in quantity, we have morbidly present nearly 0·5 per mille of *Urea*, for in health but a very slight trace of that substance can be detected.

Dr Rees states the largest amount of *Urea* he has found in the blood of Bright's disease is 0·5 per mille, and the smallest 0·209.

Dr Bright[4] states,—"In one very remarkable case, where the albuminous condition of the urine has constantly existed, as far as I know, from frequent experiment, for above three years, the quantity of urea in the blood is very considerable. The results of chemical analysis by Dr Babington were, that the urine

[1] Vide Paper by Dr Christison—Ed. Med. and Surg. Journ., vol. xxxii.
[2] Christison—Op. cit.
[3] Rees—Guy's Hospital Reports, vol. v.
[4] Bright—Guy's Hospital Reports, vol. i., 1836.

did not contain one-third of the *Urea* which it does in health, while about one per cent. of *Albumen* supplied its place. The serum of the blood was remarkably light, in consequence of its deficiency in albumen, having a specific gravity of 1021 instead of 1030; and the quantity of *Albumen* in 1000 grains of serum, amounting, after careful drying, to only 50 grains; whereas from 80 to 100 parts in 1000 is the usual proportion in healthy serum; and it contained fully as much *Urea* as the urine did, the 1000 grains yielding nearly 15 grains of that substance."

The following analyses of the urine in Bright's disease will show the relation which *Urea* and *Albumen* bear to each other and to the other constituents of the urine; but first the analysis of normal urine, as given by Becquerel, must be noticed. Specific gravity 1018·900.

Water, ...	968·815
Urea, ...	13·838
Uric acid, ...	·391
Inorganic salts, ...	7·695
Organic matter, ...	9·261
Total, ...	1000·000

Compare now the following analysis of the urine in Bright's disease (Simon[1]).

	I.	II.
Specific gravity, ...	1014	1022
Solid constituents, ...	33·90	66·50
Water, ...	966·10	933·50
Urea, ...	4·77	10·10
Uric acid, ...	0·40	0·60
Fixed salts, ...	8·04	10·00
Extractive matters, ...	2·40	—
Albumen, ...	18·00	33·60

It will be seen that in the first of these the *Urea* is only a third of its normal quantity, *Uric acid* and *Salts* nearly natural, while there is morbidly present four and a half times the amount of *Urea*, of *Albumen*. In the second, the *Albumen* is in the ratio of three to one of *Urea*.

From these statements it will be seen that in Bright's disease the *Albumen* morbidly excreted in the Urine, and the *Urea*, are correlative and vicarious principles. That in the *Blood*, while the *Albumen* is diminished, *Urea* is morbidly retained; and in the *Urine*, while *Urea* is greatly deficient, *Albumen* is morbidly present.

Might we not then reasonably expect that COLCHICUM (acting, as has been stated) would sometimes act as a favourable auxiliary in the treatment of this disease? The cases I have recorded of its use in the dropsy succeeding to scarlatina, would seem to corroborate

[1] Simon's Chemistry (Syd. Soc. Pub.)

this view. At all events, when *Ascites* or *Anasarca* are present in Bright's disease as intercurrent affections, the use of Colchicum, both as a cathartic and diuretic, seems to me to be indicated; and in those cases where *Coma* supervenes, from accumulation of urea in the blood, I am confident that it will prove of eminent service.

In the observations contained in the foregoing paper, I have endeavoured to give a correct account of the growth of the COLCHICUM plant; and have offered a suggestion as to the probable cause of the appearance of the abnormal or *adventitious* bulbs which are occasionally observed. From a careful consideration of the growth, chiefly with reference to the medicinal qualities of the bulb at different seasons, I am led to believe that the fittest time for gathering for pharmaceutical purposes is the middle of *July*. In the section devoted to the chemical history of the drug, considerable doubt has been expressed concerning the *crystalline* nature of the alkaloid COLCHICIA; that it differs, however, in many respects from VERATRIA, has been abundantly proved by the experiments of Geiger and Hesse. Considerable space has been occupied by the statement of the physiological effects of Colchicum: and particular attention is directed to the powers which it has, as a sedative, diuretic, diaphoretic, and emetico-cathartic, and to the remarkable property which it possesses of altering the renal secretion. The remainder of the paper is devoted to the therapeutic actions of the drug, particularly as a diuretic in Dropsy, a sedative in Inflammatory diseases, and as possessing a powerful control over the paroxysms of Gout and Rheumatism. An attempt has been made to refer its action in the two latter diseases, in great part at least, to the property it possesses of altering the chemical qualities of the *blood* and *urine*; and to prove, by statistics, that in Rheumatism (and it is believed in Gout also) its beneficial effects are seldom apparent until some of its ordinary physiological actions, such as diuresis, purging, or vomiting, manifest themselves. The use of Colchicum in the Dropsy succeeding to Scarlatina has been mentioned, and a suggestion offered, that its employment might be extended to some cases of Bright's disease, and for the relief of comatose symptoms consequent upon *suppression of urine*.[1]

I take this opportunity of returning my best thanks to Professors Christison and Balfour for the kind assistance which I received from them, while engaged in the foregoing investigations.

[1] An outline of this paper was read before the Royal Medical Society in December 1849.

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Professor W. C. Maclean's
Notes
with the author's compts.

CHLORIDE OF AMMONIUM

A

SPECIFIC THERAPEUTIC AGENT

IN THE

TREATMENT OF HEPATITIS AND ABSCESS OF THE LIVER,

WITH ILLUSTRATIVE CASES

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PREFACE.

The pages which follow have been drawn, to some extent, from a paper, "On the use of Chloride of Ammonium in the Treatment of Suppurative Hepatitis, and chronic affections of the liver," contributed to the Lancet in the latter part of December 1869, and which was published in that Journal of May 7th, 1870.

At that time, I cherished the belief, that a more extended experience in the use of "the remedy" would not fail to furnish fresh proof of its efficacy, in certain hepatic diseases—and so far, I am glad to say, my most sanguine expectations have been fulfilled. It now remains to be seen whether it will prove equally efficacious in a variety of climates, and in other hands, and whether I am justified in now conferring on it, for the first time, the title of "a specific" in the cure of Hepatic affections. Time will decide both points; meanwhile I have received favorable accounts, concerning its use, from Tonghoo a place which is said to be somewhat similar to Hyderabad Deccan in climate, where Hepatitis is so prevalent and fatal.

The season of the rains in India, is rapidly approaching, in which, and in the succeeding cold season, many fall victims to the hepatitis which then prevails. I am induced therefore to lay the following pages (hastily put together and sensible of their faults) before my professional brethren in this country, believing that they will be serviceable in the alleviation of suffering, the saving of life, and, in however slight a degree, the advancement of the healing art.

If, however, we desire to attain success, we must deserve it; and if, in the course of a severe and protracted illness, the means recommended in these pages, be faithfully and carefully carried out, in most cases, success may be confidently expected; but on the contrary should, a desultory practice be followed, and the medicine be not regularly and perseveringly administered, and attention to the diet and nursing be not strictly enforced, nothing but disappointment need be looked for.

W. STEWART M. D.
Surgeon 2-21st *Fusiliers.*

Rangoon,
3rd June 1870.

CHLORIDE OF AMMONIUM

A SPECIFIC IN

HEPATITIS AND HEPATIC ABSCESS.

Hepatitis is a disease, which is the cause of much sickness, invaliding, and mortality, among the European forces in India, and its tendency to eventuate in hepatic abscess, renders it one of the most formidable with which the practitioner in this country, has to contend. The treatment of suppurative inflammation of the liver is acknowledged on all hands to be very unsatisfactory; mercury is not only useless, but pernicious, and we search in vain among the numerous text books, for a therapeutic agent of sufficient efficacy to combat the disease.

Such being the case, I am induced to bring to the notice of the profession, a remedy which has proved of signal value in my hands, in the numerous cases in which it has been employed by me, and I may add, also, by others who have witnessed its remarkable success, and have in consequence been induced to give it a trial.

Chloride of Ammonium has been for a long time used by the Germans in frequently repeated small doses in hepatitis, and both the Germans and French, esteem it a valuable remedy in many

diseases, in which we either employ mercury, or other alterative deobstruents. Morhead in his researches, in a foot note states, that he has no experience of the remedy, but says the Indian practitioner will do well to try it. Dr. Clement Williams now of Mandalay, formerly in the 68th Light Infantry and first Political Agent at Mandalay, informed me that, when in his regiment, he was in the habit of using the Chloride of Ammonium in hepatic affections with marked success.*

Should a more extended trial in other hands, and in other parts of India, under a variety of climates and circumstances, contribute on the whole to like favorable results, the much dreaded suppurative hepatitis may be as effectually controlled and cured, as its twin associate dysentery, by the reintroduction of the Ipecacuanha treatment in large doses—thanks to the labors of a few Army Medical Officers.

Before proceeding to the cases which I am about to give, it will be necessary to make some brief remarks on the disease and its general treatment, for the better explaining the action of the Chloride of Ammonium, the stage of the disease in which it is applicable, and the points to be observed in its administration.

When hepatitis occurs in an individual of good diathesis, and is seen early and met by judicious treatment, the symptoms, local and general, will

* Most systematic writers on the practice of Medicine, in treating of hepatitis, make no mention of Chloride of Ammonium in its treatment; a few, allude to it cursorily, among the medicines which have been recommended in Chronic hepatitis (cirrhosis) (*Watson, Tanner*), or as an eliminant when suppuration has taken place *Morehead*), or merely as a mild tonic in Hepatic abscess. (Copland).

for the most part gradually disappear, and the patient be restored to health. It is found however in actual practice, that in consequence of bad diathesis, advanced stage, or other cause, recovery by resolution does not take place, suppuration occurs, and hepatic abscess is formed. It is of importance to detect this event promptly and without hesitation, and to mark its progress, because it calls for a line of treatment different from that suitable to the antecedent stages.* In the earlier stages, the antiphlogistic regimen and treatment are indicated according to the acuteness and severity of the symptoms, local and general, and the constitution of the patient. Should there be no accompanying dysentery, a mild purgative may be administered at the commencement, with a view of clearing out the primæ viæ and relieving congestion of the portal circulation; afterwards saline diaphoretics and diuretics, in frequently repeated small doses, should be administered; till their action is well established, after which, they may be given in larger doses, and at longer intervals. I have found a mixture containing Liquor Ammoniæ acet: drs. ii. with Tinct: Hyoscyami m. v. in each dose, administered every half hour or hour, to give most relief, allaying the feverish symptoms and calming the nervous system: while the administration of from Dr. ss. to Dr. 1. of the latter (Tinct: Hyoscyami) at bed time, after the repeated small doses during the day, will often have the effect of inducing a a little refreshing sleep, a point of great importance in this disease. The local application of ice, for a considerable period, watching well its effects, or fomentations, or bran poultices to the seat of pain in the right hypochondrium, will also act as

* See Morehead's Researches.

powerful auxiliaries and give much relief. In some few cases, the application of six or eight leeches, when there is much pain and tenderness and the patient is not reduced, may be necessitated, but in general even this amount of local depletion is not required.

The diet should consist of arrowroot, sago, milk and water ; barley water may be taken freely as a drink, and afterwards beef tea may be allowed.

By a careful adhesion to the above system of treatment in a considerable number of cases, in which the inflammation has not gone beyond the stage of vascular turgescence or commencing exudation, resolution may be effected ; and here it must be borne in mind that complete restoration of the inflamed portion or portions of the liver, (for it is rarely that general inflammation exists,) is not coincident with the cessation of febrile symptoms and local sense of pain, and symptoms referable to the affected part; in fact, recovery must be considered incomplete till several days have elapsed from the cessation from pain and febrile disturbance.*

During this time, the patient must be confined to bed, with strict attention to diet, carefully watched, and any derangement of secretions corrected by gentle means. But the symptoms instead of being removed may be only moderated by the above treatment; exudation of plastic lymph may have taken place, degenerating into pus and terminating in abscess, the deranged state of the capillary circulation in its immediate neighbourhood preventing its removal by absorption.

* See Morehead's researches.

On the other hand it frequently happens, especially in Military practice, that the disease does not come under treatment in the early stages, and not till the peculiar symptoms pointing to abscess either impending or already formed, are manifested. In either case, the treatment above described as suitable in primary acute hepatitis is no longer indicated, the treatment must now be tonic and restorative,—the diet should consist of milk, light puddings, broths or animal jellies,—and wine or other stimulants may be cautiously administered, if these do not excite the pulse, or produce irritation of the gastro-intestinal surfaces.*

At this period of the disease, when the acute symptoms have been allayed, and suppuration is either threatened or already established,—or, in the event of the patient having come under observation in the primary acute stage, as soon as the symptoms, local and general, shall have been abated, and diaphoresis freely established, by the means described at page 3, the Chloride of Ammonium should be administered in doses of grs. xx. morning and evening, noting carefully its effects, which are striking and remarkably regular in the order of their occurrence.

As a general rule, about fifteen minutes after taking the medicine, the patient experiences a sensation of warmth in the epigastrium, which, by and by extends, pervading the abdomen, and gradually becomes diffused over the entire cutaneous

* Chloride of Ammonium, being itself, a general stimulant, does away with the necessity for the employment of alcoholic stimulants, in the considerable quantities otherwise required; and unlike them, exercises, I believe, a specific therapeutic action on the liver, instead of tending to increase the diseased condition, which it is our object to remedy.

surface. The nervous system is at the same time exhilirated sympathetically, and probably also through the circulation, for the patient now feels "light headed," (as he generally expresses it), and at times drowsy. The acute pain previously experienced, in the right hypochondrium and along the margins of the lower right ribs, extending, as the case may be, forwards across the epigastrium, or backwards to the lumbar region, is either entirely removed, or in its stead, pain is sometimes referred to a point higher up, and towards the base of the axillary region, where before, none was complained of. At this stage of the operation of the remedy, patient often falls asleep relieved of all his distressing symptoms.

After the lapse of another quarter of an hour, a free and equable perspiration takes place over the entire surface, which lasts for a period varying from one to two hours: in the mean time, the pain which had shifted from the lower margins of the inferior ribs of right side, will again manifest itself, at or near its original position, or may be referred to one totally different, as the lumbar region, or even the right hip. With the evening dose, similar effects will be observed to take place, with like regularity and certainty; and with each succeeding one, the interval of relief from pyrexia and pain referred to the part affected, as well as sympathetic pains of shoulder, arm etc. (which latter are at times distressing), will gradually become longer, till at length, in favorable cases, the relief becomes complete and constant. After several doses of the medicine, the urine is much increased in quantity, (particularly in the cold season), is limpid, and passed without uneasiness. The increase is chiefly at night, causing the patient to awake

suddenly, perhaps three or four times, for the purpose of micturition. *

After a few days the appetite is much improved, and patient craves for more food, which may be given provided it be light, nutritive and easily digested; but solid food should on no account be permitted, as its ingestion would in all probability provoke a recurrence of all the acute symptoms.

During the use of the medicine, care must be taken that patient does not catch cold when perspiring; and when perspiration has ceased, the surface should be dried with warm towels, otherwise chills may be experienced.

In no standard work on Therapeutics which I have consulted, do I find the slightest allusion to the above remarkable train of effects following on the exhibition of Chloride of Ammonium. In

* The effects on the pulse, taken in conjunction with the above, may be interesting. The observations were made in the case of a patient suffering from Hepatitis, and may be taken as an illustration of the effects generally.

Before taking medicine.—Pulse 78, full and regular. Skin cool and dry. Complains of pain in right hypochondrium, and along the margins of the right lower ribs.

8 Minutes after taking Medicine.—Feeling of gentle heat in epigastrium which gradually pervaded the whole body. Pain shifted to axillary space.

30 Minutes after taking Medicine.—Pulse 82. Soft and compressible. Surface bathed in perspiration and a little above the normal temperature.

1 hour after taking Medicine.—Pulse 68. skin below normal temperature. Perspiration gradually ceasing. Patient feels comfortable.

2 hours after taking Medicine.—Pulse 76. skin covered with perspiration. Temperature normal, pain returned to a point midway between the margins of ribs and axilla.

one work it is described as a general stimulant, in another as a diaphoretic, while in a third it is merely noted as a laxative. In one only is it said to be useful combined with taraxacum in cirrhosis. The remarkable effects so constantly following its use in hepatitis are nowhere mentioned.

The silence of authors on the above points, coupled with the fact that in some cases in which I have used it, either as an experiment in health, or as a remedy in diseases, other than hepatitis, it has either been without appreciable effects, or, if any, these have been but slight, and not characteristic, seems to point to the inference that the medicine is not only a specific in certain hepatic affections, but that its peculiar action, being manifested in any given obscure case, may be considered as diagnostic of hepatic disease. The above observations however are thrown out as only probable, and suggestive of further enquiry.

A remedy which is at once found to possess the several properties of a stimulant of the capillary circulation, general and special, which is at the same time a powerful diuretic and diaphoretic, and withal anodyne, cannot but exercise a remarkable influence on the processes of nutrition and absorption, secretion and excretion.

The secretions of the skin, kidneys, and liver, abound in salts ; one of these organs may therefore become vicarious of another in removing those matters from the system. The researches of Dr. Beale also render it probable "that in disease, cer-"tain saline substances are accumulated, in large "quantity, at the seat of disease, at the expense "of some secretion of which they form a normal "constituent."

By its marked diuretic effects, solely, Chloride of Ammonium is capable of exercising a powerful influence in relieving the portal circulation, and bringing about a healthy state of the capillary circulation of the liver, thereby causing absorption and elimination of diseased products. In veterinary practice, says Dr. Joy *(Library of Medicine)* diuretics are used with excellent effects in combatting pulmonary, and other internal inflammations, as well as for getting the animal speedily into condition, and improving the state of his hide, and it is probable they are capable of more extensive application than is commonly supposed.

The cases which follow will serve to illustrate the treatment pursued in many others, and, I may add, with equal success. The first, is a case of well marked acute hepatitis, the second, third, and fourth, are cases of hepatic abscess, and the fifth, which serves to illustrate the efficacy of the remedy in chronic hepatitis, is by Dr. W. Alexander, Staff Assistant Surgeon (formerly doing duty with the 2nd Battalion 21st R. N. B. Fusiliers) and is given verbatim.

Case I. Pte. A. McK.—Upwards of six years in India. (had an attack of hepatitis in 1865.) Admitted on the 18th September 1869, complaining of acute pain, of right side, extending from the epigastrium round the margins of lower right ribs to spine—aggravated on the slightest pressure; severe pains of right shoulder, extending down outer side of right upper arm ; unable to lie on left side on account of dragging pain in right hypochondrium when in that position. Complains also of severe pain at intervals of some minutes shooting through temples ; burning pain in eyeballs; skin hot; tongue furred (white); pulse frequent. The above symptoms, in a minor degree, had been present for some time previous to admission—evening chills with cold clammy sweats and general pyrexia—towards early part of night. Was ordered a tepid bath with cold applications to head—bran poultice to side and to have Mist Diaphoret. oz. i. with Tinct. Hyosc. m. v. every two hours.

20*th*.—Febrile symptoms have subsided; pain of side and shoulder much abated. To have Chloride of ammon. grs. xx in oz. ii. Cinnam:water, morning and evening; Beef Tea diet and lemonade as drink.

25*th*.—Is much better, Continue medicine.

28*th*.—Since the 26th complete freedom from pain of side and shoulder; cutaneous and renal secretions much increased; appetite improves can take deep breath and lie on left side without pain or uneasiness.

2*nd*. Oct.—Discharged convalescent. *

Case 2 Dr. D. B.—Nearly two years in India, admitted on the evening of the 5th Oct. 1869. Complained of purging frequently during the day and previous night, also of acute pain over entire surface of abdomen. There was great tenderness over right hypochondrium and abdomen generally, and the slightest pressure of the finger caused great increase of pain—Countenance expressive of suppurative hepatitis—anxious, pale and bathed with cold perspiration, tongue coated; skin dry but of natural heat; pulse frequent.

Owing to the great severity of the pain, six leeches were applied to the side and the patient had a tepid bath with much relief to the symptoms, local and general. Had Ammon: Chlor: grs. xx.—and in case the purging continued, was ordered, Pil:—Hydrarg: gr. viii; Pulv: Ipecac: Comp. gr. xii. m. divide in pil: iv:—one to be taken every two hours.

6*th*.—After consultation this morning it was agreed that the case was one of undoubted abscess of the liver, of a severe nature, and in which the prognosis was anything but favourable. Surface was now cold; face and hands bedewed with cold sweat; pulse 92, small and weak; was not purged during the night. To have brandy flip and three pints beef tea as nourishment. 1½ P. M. surface still cold, pulse 92,—another brandy flip, continue bran poultice, and to have Ammon: Chlor: grs xx. 4 P. M. surface warm, pulse 92, perspiring freely; passed a large quantity of high coloured urine during the day. To repeat Chlor: Ammon:—

7*th*.—Bowels moved five times during night, motions feculent; passed urine six times during the night; perspired a

* *Note*.—After attending hospital for a short time this man returned to his duty and up to date 20th Decr. 1869 has had no recurrence of pain or other symptoms and his general health is better than it had been for a long time previously.

good deal. Repeat pills ordered on the 5th, to take one every two hours. Beef tea diet, four ounces port wine.

8*th*.—Pulse 84, feels better, bowels quiet.

11*th*.—Pain of side much relieved, looks better, bowels regular. Had some sleep during the night; pulse 80. Complains of short dry cough which commenced yesterday about noon and continues to be troublesome. Tea diet, two pints beef tea, two pints milk, six ounces port wine, and barley water for drink. Continue medicine.

17*th*.—Since last report has continued pretty much the same with slight accessions of pain in side and febrile symptoms from time to time; last night pain was very severe, easier this morning. Continue medicine; apply ice to side. *Vespere*—Feels the ice agreeable, pain easier—pulse 76.

18*th*.—Much relieved, slept well last night, appetite good. Continue Chlor: ammon:—

27*th*.—Since last report has continued gradually to improve; appears cheerful this morning, feels and looks much better; Can lie on either side with perfect ease; on taking a deep inspiration feels a slight catch in breathing. Continue Chlor: ammon:—

20*th Novr*.—Since last report his health and spirits have improved daily; is now able to move about the ward without pain or uneasiness; fulness of side, which was observed from an early period of the disease, has disappeared and patient can bear considerable pressure over hepatic region without pain.

Note.—Up to date, (20 Decr. 1869) Patient has continued in hospital convalescent and is now taking Chloride of Ammonium in grs. xv. doses twice a day; his appetite is good and he is gradually gaining strength.

Case 3.—Drummer J. S. 2-21st Fusiliers, 5 years in India, admitted into Hospital on the 21st December 1869, complaining of acute pain and tenderness over the entire abdomen, towards evening pain of right hypochondrium was also complained of, Decubitus dorsal, unable to turn on either side, or take a deep inspiration. Countenance sallow and anxious, skin hot; pulse frequent, tongue furred, white; six leeches were at once applied to affected side, after which he had a tepid bath, and bran poultice to right hypochondrium. Was ordered Liquor: Amon: acet. Drs. ii, with Tinct. Hyoscyami m. v, every half hour. Barley water to drink.

22*nd*.—Abdominal pain relieved. Pain of right side and along inferior margins of lower right ribs continues, the slightest pressure being intolerable. Skin cool and moist, pulse-frequent; to have Chloride of ammonium grs. xx, twice daily. Beef tea two pints; barley water four pints.

23*rd*.—*(Vespere)*.—Was seized with sickness of stomach, and vomited a quantity of green bilious fluid, when he says he "felt something tear" in his right side.

December 24*th*.—The medicine yesterday had the effect of relieving local pain and tenderness, and induced free action of the skin and kidneys, Pulse 102, irritable; skin bathed in cold perspiration, Tongue cleaning;— pain of side relieved: feels weak. Ordered beef tea four pints, (to be boiled down to two). Six ounces of Port wine; barley water for his thirst.

Vespere:—During the day patient became alarmingly ill, and was, for a short time, semi-collapsed, requiring the exhibition of stimulants. etc., with the effect of restoring the pulse and heat of surface. Well marked hectic fever; surface bathed in cold clammy perspiration; countenance sunken, anxious and murky; pulse 124, small and irritable. Continue medicine; diet as before.

25*th*.—Expresses himself as better this morning. Slept some during the night. Pain of side relieved, but from time to time returns slightly. Each dose of the medicine brings the usual two hours or more of relief—Pulse 108; surface bathed in perspiration. Cont: med: Diet as before with two pints of milk.

26*th*.—Slept during the night—looks more cheerful, skin cool, tongue clean; pulse 98. Pain of side is now but slight. Expresses a wish to have the medicine more frequently,—owing to the relief from pain experienced after its ingestion; repeat the medicine, thrice daily.

27*th*.—Is better,—pulse 96—Cont: Med:

29*th*.—Since last report, hectic fever, with evening exacerbations and profuse sweating, has been present. There is considerable fulness of right hypochondrium and toward margins of right inferior ribs; but there is little pain of those parts except on pressure or lying on left side. Cont: Med: etc.

January 2*nd* 1870.—Since last report has steadily improved; Countenance bright and cheerful—Appetite improving. Cont. med, twice daily.

4*th*.—Still some fever, increasing towards evening. Is however on the whole improving and looks hopeful and cheery. Pulse 92, soft and pretty full. Cont: Med:

8*th*.—Progressing favorably—Pulse 88, appetite good. Fulness of right side gone, and moderate pressure over hepatitic region causes no pain. Febrile symptoms are now but slight.

11*th*.—Since last report fever has returned with evening exacerbations. Skin hot, pulse 104, irritable. Cont: Med: thrice daily.

12*th*.—Felt much better yesterday evening after midday dose, slept well during the night. Pulse, 90, skin cool and moist.

19*th*.—Since last reports has been almost free from fever; pulse 88, skin cool, appetite good.

23*rd*.—Is daily gaining health and strength; pulse 86, fuller and stronger.

27*th*.—Permitted to sit up a little during the day. Low pudding diet and two eggs.

February 9*th*.—Since last report has steadily improved in health and has been able to take exercise on foot in the hospital enclosure. Has taken no medicine for several days. Discharged to proceed to England with the invalids of the season, for change of air.

Case 4. 7*th May* 1870.—Private R. T. $11\frac{3}{12}$ years in India, was admitted into Hospital yesterday from off guard, doubled up with acute pain of right hypochondrium, extending round to loins and upwards to top of right shoulder, was unable to stand erect. Surface bedewed with cold perspiration. Had a bran poultice to his side, and an anodyne draught. For the past nine months has suffered pain from time to time in right hypochondrium, with accompanying chills at night, pyrexia, and cold sweating. The liver is enlarged and acute pain is felt at a point between the 5th and 6th ribs, midway from their extremities, aggravated on the slightest pressure. Decubitus dorsal—unable to lie on either side; tongue slightly furred, moist, broad and flabby, presenting at the sides, indentations of the teeth; skin perspirable; pulse of good volume, 84; urine high colored. Or-

dered Liquor ammon: acet. drs. ii, with Tinct. Hyoscyami, m. v, in barley water every hour. Six leeches over the seat of pain in right hypochondrium, and at 5 p. m. to have grs. xx, Chloride of Ammonium.

8th May.—The usual characteristic effects followed the exhibition of the medicine yesterday evening, but, (as in the case of Pte. F———, another case of hepatic abscess at present under treatment), patient felt a chill and a sensation of cold for some time before the sensation of heat commenced. (This phenomenon was however, a purely subjective symptom as was evidenced afterwards by thermometric observation, and may depend on difference of climate, the rains having just commenced). Patient felt drowsy, and fell asleep in about half an hour after the dose, and awoke, in an hour or so, as he expressed it, "light and refreshed, and able to bear the weight of his own body" which before distressed him. This morning he feels no pain in the recumbent position, and can move slightly in bed without pain; pulse 98. Tongue slightly furred. Continue Chloride of ammonium grs. xx, twice daily.

9th May.—Is much easier; no pain of side except on a deep inspiration; pulse 100; marked hectic symptoms have been present since yesterday, pointing unmistakably to the existence of Abscess of the Liver.

10th May.—Yesterday it was hot and oppressive and patient was bathed in perspiration, his pulse was weak and frequent and he was ordered four ounces of port wine. This morning he is much better; pulse 79, pretty full; countenance cheerful. Perspires much less. Continue medicine.

13th May.—Progressing favorably since last report; but there is slight pyrexia especially towards evening, evidenced in increased heat of hands and arms—and forehead and face feels hot at times. Pulse this morning 64, full and regular. To have a dose of simple diaphoretic mixture at 11 A. M, and again at 2 P. M.

15th.—Is much better; Diaphoretic mixture relieved the feverish symptoms; skin now cool and perspirable, tongue clean; pulse 62, appetite returning. Continue Chloride of Ammonium morning and evening; Liquor: Ammon: Acet: Dr. i. with Tinct: Hyoscyami: M. V. in the interval, as before.

18th May.—Doing well—pulse 56, full, slow and regular, port wine, four ounces.

26th May.—Since last report, has continued steadily to improve; tongue clean, smaller, not so flabby as formerly and indentations caused by teeth disappearing. Hepatic dullness commences over sixth rib of right side, and extends about half an inch below margin of right lower ribs in a gently curved line upwards towards epigastrium. Pari passu with the improvement of the symptoms, local and general, the action of the medicine has been less and less manifested, so that its effects are now not so marked.

30th May.—Since last report, patient has been allowed to sit up, from time to time, daily; he is now convalescent, and beyond feeling side a little stiff is free from pain or other uneasiness. The edge of the Liver can no longer be traced under the margins of lower ribs, and firm pressure causes no pain over the hepatic region.

Case 5. Chronic Hepatitis.—Pte. D. M. 2-21st Fusiliers. A stout muscular man of intemperate habits; with ten years service, six of which has been spent in India, was admitted into the detachment hospital at Port Blair on August 1st 1869, having a tumour which is described by the Medical Officer in charge, as follows:—

"A swelling the size of an orange was discovered in the epigastric region, exactly in the mesial line, perfectly circumscribed and immovable when grasped by the hand or when the body is turned on either side. He states that he strained himself a few days before admission and never saw the swelling until then."

He remained under treatment till the middle of September when he was forwarded to the Regimental Hospital at Rangoon, with the history of the case from which the above is taken. On presenting himself at Hospital he was carefully examined by both Dr. Stewart and myself: but we failed to detect any tumour or swelling of any kind. He was admitted however and kept under observation and in a few days the case was diagnosed as one of Chronic Hepatitis; the chief symptoms being a constant pain in epigastrium and hepatic region, a furred tongue, feeling of nausea after food and constipation. Leeches were applied followed by poultices, and Nitro-Muriatic acid, was administered with considerable benefit and relief; but it was not till I commenced to give Muriate of Ammonia in 20 grain-doses that he got rid of these symptoms: first the pain became less annoying and gradually ceased, the tongue cleaned, at the

same time the secretions (especially the urine) increased in quantity.

The effects of the medicine are described by the patient as producing a glow of heat and a feeling of warmth and comfort, followed by copious perspiration and an increase in the quantity of urine. Ten days after commencement of the treatment he was discharged well.

It will be seen that purgatives, commonly recommended at the onset of the disease, have been carefully avoided, and for this reason, that, I believe in many instances, the exhibition of such irritants, lays the foundation of the dysentery so often an accompaniment. A mild purgative may be prescribed at the outset, if indicated ; but, with the use of Chloride of Ammonium, its repetition will seldom be required.

Counter-irritants, too, with the exception of sinapisms, in a few instances, have not been employed : blisters are contra-indicated, owing to their irritant action on the kidneys, which would prevent the due elimination of diseased products by those emunctories.

There is a risk also " that the cutaneous and " sub-cutaneous fulness, caused by serous effusion, " consequent on the irritation of a blister, may, " if present at, and below the margin of the right " ribs, be mistaken for the sign of liver enlarge- " ment, and an erroneous inference, in regard to " the progress of the disease, be therefore enter- " tained." *(Morehead.)*

It would be superfluous to give any more cases in detail—Many interesting ones, however, are on record in the Hospital books. Since the first of September 1869, from which time the systematic treatment of Hepatitis by Chloride of Ammoni-

um first commenced, (a period of 9 months) 31 cases of the disease, have been treated, either by myself, or the Assistant Surgeons of the Battalion ; and of these, 6 were undoubted cases of Abscess of the liver, presenting the physical signs, the general symptoms, and the well marked hectic fever, diagnostic of the disease under such circumstances. In four of the cases, the hectic fever was severe ; in one especially so, and accompanied with excessive wasting of the tissues, and extreme prostration of the vital powers, patient exhaling the cadaveric odor, at times observed in low and exhausting disease with typhoid symptoms.

Hepatitis is a disease of this Station, and has been the occasion of much mortality here, as elsewhere. From a statement, kindly furnished by Dr. Shelton, Principal Medical Officer, British Medical Service, I find, that in the Head Quarters 2-24th Regiment, Rangoon, and Detachment Port Blair, out of a total strength of 795, there were, during the year 1868, 32 admissions and 5 deaths from Hepatitis. "The P. M. in each instance shows the cause of death to have been hepatic abscess."

During the same period (1868) in the 2-21st, Fusiliers at Secunderabad, out of an average stength of 868, there were 86 admissions, and six deaths, from the same cause. The disease was treated on the usual expectant plan, and with a result not very satisfactory. Compare these figures with those which follow, and see how different the result obtained under the treatment by Chloride of Ammonium.

Since September 1st, 1869 to May 31st 1870 (a period of 9 months) there have been 31 ad-

missions from Hepatitis, at this station, out of an average strength of 608. Of these, 6 were undoubted cases of abscess of the liver, and in several, abscess was strongly suspected. All of the above were successfully treated, without a single death. It is also remarkable, that, since the arrival of the Battalion at this station at the end of December 1868, up to 31st May 1870, embracing a period of 17 months, there have been 58 admissions from Hepatitis and but one death. The fatal termination, in this instance furnishing negative proof, corroborative of the testimony already adduced, of the very great success of the Chloride of Ammonium treatment; for it is to be observed that the patient died at a period, antecedent to the introduction of that practice, that dysentery of a very severe type supervened, uncontrolled by any of the remedies employed, and that the autopsy revealed the existence of abscess, which occupied almost the entire liver, the structure of which, was reduced to a mere shell,—the large intestine was ulcerated throughout its entire extent, and in places gangrenous.

In not one of the cases treated by Chloride of Ammonium, was there the slightest tendency to Dysentery observed.

According to the Army Medical Department, Report for 1867, out of a total strength of 56,896 European Troops in India, there were, during the year, 3078 admissions from Hepatitis, and 157 deaths. During the same period 368 were invalided on account of the disease, and 96 were discharged the service at Netley.

I confidently look forward to a gradual and great reduction of this vast expenditure of life

and health, in time to come, if the means pointed out in these pages, be faithfully and earnestly carried out, recollecting that it is by attention to small, and seemingly unimportant matters, as regards regimen, diet and nursing, as much as by the prescribing of medicine, that success will be attained. The medical man must think nothing beneath his care and attention, particularly where untrained orderlies and soldier attendants, possessing no knowledge of nursing, are placed over cases of serious illness. The words of the poet are particularly applicable to affairs medical:

> "Think nought a trifle, though it small appear;
> Small sands the mountain, moments make the year."

At the risk of being considered tedious, and unnecessarily prolix, I cannot refrain from making the following quotation from a leading article in the Lancet of 30th October 1869, wherein the writer speaking of the difficulties which the Doctor encounters in civil life, in obtaining aid in the management of the sick room, goes on to say:—

"In all matters about which he (the Doctor) "may omit to give explicit directions, the most "fatal errors are frequently made. For example, "it is very common for patients to be killed, after "enfeebling illness, and when with proper care, "they would recover, by being suddenly raised "from the recumbent to the semi-erect posture for "the purpose of taking nourishment. No practi-"tioner who neglects to lay down very strict rules "on this point will fail, to have many unexpected "and sudden deaths amongst exhausted patients; "deaths for which he may not always be able to "account, but which may be shown, on enquiry, "to be traceable to the cause we have indicated."

Whether the patient be very low or not, the

condition of an inflamed liver, is not unlike that of an inflamed joint, demanding strict quiescence in the recumbent posture; and therefore a steady and intelligent attendant should constantly wait on the patient in all severe cases, and the bed pan, and urinal, should, at all times be at hand, so that the patient may not have the least occasion to quit his bed.*

In the foregoing pages my remarks have been chiefly confined to the therapeutic uses of Chloride of Ammonium in the primary acute stage of Hepatitis, and in Hepatic Abscess; in Chronic Hepatitis, however, it is equally efficacious, as is well illustrated in case 5. In short, I have found it valuable in hepatic affections of whatever form, whether depending on organic disease, or functional derangement. I have also found chronic dysentery, associated with chronic disease of the liver, yield to a few xx. grs. doses of the Chloride of Ammonium, after Ipecacuanha, and other remedies had failed; and I have before me, notes of the case of a young Officer, similarly affected, whose dysentery was checked after a few doses of 8 grs. each. † In such cases from v. to xx. grs.

* Whilst writing, an instance has presented itself, which shows forcibly, how easily a recrudescence of inflammatory action, may be brought about by a cause, which, at least, in this instance, was entirely under the patients control. A man in Hospital, suffering from a severe attack of acute Hepatitis, was suddenly seized with a recurrence of the acute symptoms, local and general, (after these had been allayed for a considerable period, by the previous treatment). The reason was easily discovered; on enquiry, I found, that the patient, having become tired of lying on his back, turned on his side for a short time, and in this simple manner caused the mischief.

† In passive congestion of the liver, I have found a few doses (grs. xx) of the medicine effect a remarkable reduction of the enlarged viscus, and afford great relief to all the symptoms.—In fact, the specific action on the liver, is manifested in almost all the diseases to which that organ is liable.

may be given, dissolved in ounces ii. of infusion of cascarilla, twice or thrice daily, according to circumstances: and to cover the saltish taste of the medicine, a little Ext; Glycyrrhizæ (say grs. v.) may be added to each dose.

It may be interesting to note the number of grains of the medicine administered, in the treatment of the 31 cases of Hepatitis, in the Hospital 2-21st Fusiliers, from 1st September 1869, to 31st May 1870, taken from a record kept by Passed Hospital Apprentice M. Devanboo, attached to the Battalion.

Total number of grains	21,926.
Average No. of grs. administered to each patient	707.27
Maximum do do in any one case *(abscess of liver)*	2,490.
Minimum do do do *(Hepatitis)*...	120.
Average do exhibited to each patient in 6 cases abscess of liver	1,428.
do do do do do in 25 cases Simple Hepatitis*	569.

*Several of these were strongly suspected to be cases of latent, and deep seated abscess.

It will be seen from the above figures that the Medicine is used pretty freely, and that in some cases very large quantities have been required; in fact its use should be persevered in, till its sensible effects be no longer manifested, or only in a slight degree; and it is well to continue it for sometime afterwards in smaller and more frequently repeated doses, in the event of liver enlarge-

ment, with feeling of stiffness, weight, or other uneasiness continuing. *

Since going to press, I have received the following letter with case from F. Maynard Esqr., Surgeon, Health Officer, Port of Rangoon, which, with his permission, I gladly publish.

The case is an interesting one, faithfully recorded, and well illustrates the therapeutic use of the remedy, and the chief points to be observed in its administration.

RANGOON, June 6th 1870.

MY DEAR STEWART,

I have much pleasure in sending you the notes of a case of Acute Hepatic Abscess under my care and which you kindly saw with me on two occasions.

Having had the advantage of reading your paper on the treatment of Hepatitis with Ammon: Chlor:, I have taken some care in noting its therapeutic effects throughout the treatment, and in the report have taken down the exact effects of the medicine, as described by the patient himself; and which seem to agree in a marked manner with the notes of those cases treated by yourself.

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*It may be worthy of note, that in India, Chloride of Ammonium is obtainable at a cheap rate in the bazaar, under the Hindustani name ——(*Nousádar*)—— (*Duk*)—— (*Nouságar*). † I have obtained the salt sufficiently pure for medicinal purposes, in the Rangoon Bazaar for Rs. 1/12 per viss (equal to 3¼ lbs. avoirdupois). I mention these facts, because, on one ocasion, while I had several serious cases under treatment, I ran out of the salt completely, and none was obtainable in the medical Stores, a circumstance likely to happen in Indian Mofussil Stations as hitherto the drug has been but little in demand, having been used chiefly in the prepartion of Cold and other lotions.

†The Burmese name, is, *Zawana*.
In Tamil, it is called, *Navásk-chárum*.
In Ceylon, it is known under one of its Tamil names *Nasichárum*.

I would remark that instead of using the hot fomentations as usually adopted by you in Hospital practice, I find that in "private practice" it is better to use hot applications in a dry form, as from want of proper attention, or through neglect, or from the greater trouble in using hot fomentations, I seldom find my instructions carried out, and even if they are, the patient generally complains of great discomfort, and sometimes chilliness, from having his clothes, bed linen, and bed saturated, which often tends to produce evil results.

The plan I adopt, and which is easily carried out, is,—to place two bricks on a burning charcoal chatty, on the top of these I place 2 bags of the size required, and only ⅓ filled, with 1 part salt and 2 parts bran. I do not fill the bags, as they would not then become so readily conformable to the shape of part required.

The heat is retained longer then with hot fomentations and is much pleasanter to the patient, and I believe has an equally beneficial, if not better effect. One bag is always kept hot during the application of the other.

Although this is the first case of Hepatitis that I have treated with the Hydrochlorate of Ammonia, I shall (from the decided therapeutic effects I have seen produced in the treatment of my own recorded case, and from the experience I have gleaned from having had the opportunity of seeing the same treatment adopted with such success in your own Hospital) undoubtedly carry out a similar plan in all cases that may hereafter come under my care, and I trust and believe with like beneficial results. I sincerely hope that the perusal of your pamphlet may lead more medical men to give this treatment a trial, and I feel sure that if the rules laid down are properly carried out, they will meet with similar success to cases recorded, and will look upon the Ammon: Chlor: as an almost specific therapeutic agent in the treatment of Hepatitis. If you think my report of any interest I leave you to make what use you please of it.

I remain

Yours sincerely,

F. MAYNARD.

Case of Acute Hepatic Abscess under the care of

F. MAYNARD *Surgeon.*

Health Officer, Port of Rangoon.

May 4th 1870.—10. 30. A. M. Mr. W———ætat 35, "Eurasian," born in Burmah (of highly nervous temperament, accustomed regularly to take his 3 glasses grog daily, besides exceeding when in company) visited me, and complained of acute pain in the right hypochondrium, extending over nearly the whole of right side of abdomen, and more especially severe in the iliac region, was unable to stand upright, or take an ordinary deep inspiration, and constantly cried out with pain. On examination found slight fulness below margin of right ribs, and great tenderness on the slightest pressure, over whole of right side of abdomen. Skin hot, pulse 126, an anxious expression of countenance, sallow complexion, tongue furred. Stated he had suffered from pain in hypochondrium for 6 days, that 3 days ago he had a distinct rigor, followed with fever, and that the pain had been increasing up to date. I advised his return home immediately, and ordered perfect rest, hot application to the side, and Pulv: Doveri grs. 8 immediately, and to repeat in 4 hours. At 2-30 was visited by Dr. Stewart and myself; found him lying on his back, with legs drawn up, and unable to move owing to the acute pain. His skin was slightly moist, and pulse reduced to 116 (excessive action of heart on first examination, probably attributable to the exertion of walking to see me under existing circumstances). Was unable to bear percussion, or the slightest pressure on any part of right side of abdomen. Ordered 8 leeches to side and Liquor. Ammon: Acet: Drs. 2 Tinct: Hyoscyami M. v. in barley water every hour, and at bed time Tinct: Hyoscyami Drs. i. Hot applications with salt and bran bags to be constantly applied after removal of leeches.

May 5th.—Passed a bad feverish night; had no sleep, pain more or less removed from iliac region and centered over the hepatic region, and especially just below the margin of right inferior ribs, where it was very severe; unable to bear the slightest pressure, or turn on either side. Bowels open once during the night, dark coloured and very offensive. Skin slightly moist, and pulse 102. At 9-15 A. M. administered Ammon: Hydrochlor: grs. XX. in cinnamon water, at 9-35—20 minutes after, he described that he had a sensation of warmth in the stomach, which gradually extended over the whole surface of body. General perspiration gradually followed, and the pain

in hypochondrium was sensibly relieved; and he began to think he was "getting all right again." (His own words). He felt drowsy, and inclined to doze off to sleep, but shortly a kind of twisting pain came on in his right groin, and gradually extended up, returned to its former seat below margin of right inferior ribs. Visited at 2 P. M. found abdomen much distended with flatus, of which he was constantly passing large quantities. Had made urine twice, high coloured and scalding; Pulse full, 102. Tongue dry and furred, complaining of great thirst; ordered milk and water and barley water, and to continue hot applications. Visited him at 6 P. M. Had made water once since 2 P. M., had slept ¾ hour, and on the whole pain greatly reduced. Abdomen less distended, and feeling altogether more comfortable. Pulse 100.—Tongue dry and furred and constant thirst. In addition to his barley water and milk, an egg to be beaten up with milk. Repeated Ammon: Hydroch: haustus at 5 P. M. Same symptoms as described after first dose, ensued; at 5-30, pain removed towards centre of abdomen, 3 inches below umbilicus.

May 6th.—Visited at 10-15 A. M. After last evening's draught, the pain was relieved for some time, but gradually returned to old spot; he had passed a bad night, no sleep. First thing in morning, vomited eggs and milk, and stated that afterwards pain had shifted over to left side. At 8 A. M., took Ammon: Chlor: haustus, and 13 minutes after; had a great deal of pain in stomach, which only lasted 5 minutes, and at 8-30 sensation of heat of the whole cutaneous surface set in, followed by perspiration.

9. A. M. Had a moderate, soft, dark and offensive motion; after this he dozed off, and I found him asleep when I called.

Visited at 1-30 p. m. Had taken a cup of chicken broth with relish, made water more abundantly. Pulse 108, smaller. Skin moist; pain in hepatic region less. Unable to turn on either side.

Visited again at 6-15 p. m. passed one motion since 1-30 p. m. light colored and watery. Took chicken broth at 3 p. m., took Ammon: Hydroc: haustus at 5. p. m.; on this occasion, no peculiar sensation about epigastrium observed, but ½ an hour after, general sensation of warmth, perspiration and drowsiness gradually ensued. No pain in hepatic region, excepting when moving, and can now allow slight pressure below margin of right lower ribs, where there is a distinct prominence. Makes water much more abundantly. Thirst still great.

May 6th.—Pulse 102. Skin moist, tongue furred, the bran and salt bags have been kept constantly applied, and from these he states he experiences great comfort and relief.

May 7th.—Visited at 10-30. Had slept a little last night, bowels opened 8 times since 11 o'clock last evening, dark brown, watery and offensive, accompanied with a large amount of flatus. Has an anxious expression of countenance, with sallow complexion, and conjunctivæ slightly injected; is very hysterical, and low, but though feeling very weak, he describes himself as better, as he can turn over on to the left side without pain, and has only slight pain at margin of lower ribs on right side, when he tries to raise himself up; pulse 96. Tongue cleaner, thirst still excessive; to continue former diet with addition of beef tea. The morning draught only caused sensation of warmth and perspiration over head and extremities. Visited at 8 p. m. had no perspiration after evening draught, but feels inclined to sleep; complains of pain again in the old spot occasionally. Pulse 102.

May 8th.—Visited 8-45 a. m. slept well, but had four motions during night. Pulse 90. Tongue less furred. Ordered Pil: Hyd: Gr: i, Pulv: Doveri Grs: iii, every second hour during day. Diet and treatment as before.

Visited at 7 p. m. Pulse 90. Skin cool and moist, makes large quantities of water, pain less.

May 9th.—Visited 9 A. M. States that the Ammon: Hyd: Haustus has not now the same effects as formerly, only producing drowsiness and slight perspiration. Seems very low and desponding. Ordered port wine and jelly in addition to former diet.

2 P. M. Visited by Dr. Stewart and self; case considered by Dr. Stewart to be progressing favourably. Can bear slight pressure over hepatic region; but as no good can result from these examinations, I forbear making them. Enlargement of side decidedly decreased. To omit Pil: Hydr: Pul: Doveri.

May 10th.—No pain referred now to hepatic region; but a dragging sensation described, can breathe freely, and turn over on both sides. Pulse 90. To continue same diet and treatment.

May 11th.—Visited 10-30 A. M. Slept well last night, has no pains on turning or getting up; only experiences the dragging sensation as described yesterday when he gets up or takes a deep breath. Tongue clean and moist. Pulse 84. Perspired profusely last night about the head and face; bod-

hot; bowels once open, of better consistence. Ammon: Hyd: taken night and morning, no perceptible effect produced but that of drowsiness. Slept off and on greater part of day.

May 12th.—Had profuse perspiration all last night, and towards morning, his head, hands and feet were burning hot; this passed off, and at 10 a. m. he stated that he felt quite well, only weak. Pulse 84.

May 13th.—Last night experienced same profuse perspiration, and heat of hands, &c. as described yesterday, and lasting 3 or 4 hours. This morning for 1st time felt pain in right shoulder which lasted about 2 hours; at 10 a. m. had a distinct throbbing sensation under margin of lower right ribs, which lasted a few hours, and apparently relieved by the constant application of salt and bran bags. Pulse 90.

May 14th.—Visited 11-45 a. m. Pulse 90. Skin generally dry; hands hot and dry. Slept from 7 o'clock to 12 last night, and after that, very restless; profuse perspiration of head and face, and great heat of surface of body and extremities; this passed away towards morning. Tongue furred and parched. Incessant thirst. No pain except in right shoulder.

May 15th.—Visited at 3 p. m. Went to sleep at 8 o'clock last evening, and awoke at 10 with sensation of great heat in head and extremities, and especially in palms of hands; this lasted about 20 minutes, and then profuse perspiration ensued. Slept for 4 hours, and awoke feeling well. Pulse 92. Bowels opened 3 times, passing much wind. The Ammon: Hyd: Haustus to be omitted in morning, and a Diaphoretic Mist: ordered during day.

May 16th.—Visited 12-30. Had no return of fever last night. Bowels relaxed. Pulse 86, skin soft and moist. Treatment as yesterday.

May 17th.—Visited 11-30 a. m. Pulse 75. Skin soft and moist, Tongue cleaner, slept pretty well. Bowels open once today; has occasional throbbing pain in hepatic region.

May 18th.—Altogether better, pulse 76. No pain; slept well. Has no thirst; continue Diaphoretic mixture, and Ammon: Hyd: only at bed time.

May 20th.—Same as yesterday, &c.

May 21st.—Pulse 80. Had a hard costive motion. To discontinue Diaphoretic mixt: and continue Ammon: Hyd; bis in die.

May 25th.—Has been gradually improving; can get up by himself, turn round, and walk without pain, and can bear firm

pressure over whole hepatic surface. *Allowed* to sit up. Ammon: Hydrochl: reduced to grs x, bis in die c. Decoct: Cinchon: nocte maneque; ordered mutton chop and 3 glasses port wine daily.

May 30th.—Has a good appetite, tongue clean, bowels regular. On examination I find great enlargement of liver which, on standing up, extends to 3½ inches below margins of inferior right ribs, and is hard, firm, and the size of a flattened orange. No pain experienced on firm pressure or percussion over this. Patient describes himself as feeling perfectly well, free from any pain, and gaining strength daily, can take moderate morning and evening exercise, and is gradually commencing his ordinary diet. Considered convalescent.

This case will be carefully watched, and notes of interest recorded.

HYDATID DISEASE

OF THE

LIVER:

ITS DIAGNOSIS AND TREATMENT.

BY

MORTIMER BALDING, B.A., M.D. CANTAB.

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Act for the Degree of M.D.

On 1st day of December, 1880, at 10 a.m.

THESIS: "THAT IT IS ADVISABLE THAT THE ASPIRATOR SHOULD BE FREELY USED AS AN AID TO DIAGNOSIS, AND AS A GUIDE TO FURTHER TREATMENT, IN CERTAIN FORMS OF TUMOUR IN THE HEPATIC REGION."

Mortimer Balding, M.B.,
Of Gonville and Caius College.

20th day of November, 1880.

Hydatid Disease of the Liver:

its diagnosis and treatment.

It is proposed to consider the differential diagnosis of certain forms of tumour in the hepatic region; what amount of aid in their diagnosis can be obtained by the free use of the aspirator; and with what amount of danger this free use is attended.

Uses and Dangers of the Aspirator.

It must be obvious to the most casual observer that the introduction of the aspirator and the withdrawal of only a few drops of fluid will at once exclude many of the conditions below mentioned; but the same cannot be said with reference to the failure to find fluid, for the needle may not have been introduced to a sufficient depth to reach it, or the fluid may be too viscid to pass through the needle even under the exhausting power of the aspirator.

The dangers urged against the aspirator are—

1. That you may give rise to suppuration by the admission of air.
2. That you may cause hæmorrhage by the puncture of a blood-vessel.
3. That in case of malignant disease you only irritate and do harm instead of good.
4. That you may cause sudden death from shock.
5. That you often set up inflammation in the serous sacs.

These objections are, in my opinion, best answered by the following Table, which is a very brief statement of the various purposes and conditions under which the aspirator has been employed by Dieulafoy, from whose work they are extracted.

TABLE I.

	Cases.	Aspirations.	Cures.	Deaths.	REMARKS.
Anal abscesses	7	10	6	...	1 fistula in ano
Metastatic and chronic abscess ...	15	39	15	...	or doing well
Sanguineous effusion	4	4	4	...	
Hyd-arthrosis of knee	50	120	50	...	No ill-effects
Do. with fract. of patella ...	1	...	...	...	Suppuration
Bursæ	3	10	3	...	
Hydrocele...	5	11	5	...	No accident
Pleurisy	2	...	2	...	
Do.	5	45	5	...	
Pericarditis with effusion ...	3	3	1	2	
Hydrocephalus	5	46	...	5	Note A
Spina bifida	2	10	2	...	
Ovarian cysts	2	16	1	1	1 cyst mult. loc.
Retention of urine	20	98	...	Many	Note B
Hydatids of liver	7	315	7	...	Urticaria, 2 cases
Abscess of liver	1	2	1	...	
Do....	1	Many	1	...	
Used as stomach-pump	1	...	...	...	Good results
Hernia	30	30	25	5	Note C

A.—All these cases eventually died, but in no instance is there reason to believe that death was accelerated by the use of the aspirator.

B.—No accident; no evidence of any ill-effects from the puncture in any instance. Many of the cases died, but this seemed from other causes. In some cases which were examined after death no peritonitis at the seat of puncture could be detected, and the wound itself was scarcely visible.

C.—20 cases reduced after aspiration alone.
4 cases, herniotomy after aspiration had failed, cured.
3 cases, herniotomy after aspiration had failed, died.
3 cases, sac only aspirated herniotomy, 1 cured, 2 died; in no instance did any accident follow aspiration.

I have myself for some time past been in the habit of frequently using the aspirator, introducing it into the pleural cavity, lung-substance, liver, stomach, intestines, and bladder; and although some surgeons have a strong objection to its

introduction into the last-named viscus, I have never seen any ill-effects follow its use.

From the above I am induced to draw the following conclusions:—

1. That it is always possible by means of the aspirator to investigate any supposed collection of fluid.

2. That should your diagnosis not be correct, and you introduce the needle into the substance of the lung, liver, kidney, intestine, aneurism, or cancer, no danger is reasonably to be apprehended, provided the following precautions be observed:—

1. Be sure that your needle is clean and pervious.
2. Introduce it somewhat rapidly and freely in the direction of the supposed collection of fluid.
3. On no account use manipulation.
4. In withdrawing the needle, keep the integument pressed firmly against the subcutaneous structures.

AREA OF NORMAL HEPATIC DULNESS.

Before speaking of diseased conditions of the liver, we will indicate by the following Table the normal limits of this organ at those points where its limits are most readily ascertained; of course its entire outline would be approximately indicated by lines connecting the points named.

TABLE II.

	Above.	Below.	Vertically.
Back	10th–11th verteb...	Con. with kidney	
Angle of scapula ...	9th space or rib ...	12th rib	4 inches.
Axillary line ...	7th space or rib ...	10th space... ...	4 to 5 inches.
Right nipple line ...	5th space or rib ...	Costal arch ...	4 inches.
Median line front ...	Base of ensiform cartilage.	Midway between ensiform cartilage and umbilicus.	3 to 4 inches.

Left of median line, previous-named limits continued to apex of heart.

Circumstances causing an increased area of Dulness in the Hepatic region.

This increase in area of dulness may be due—

I. To an area of dulness continuous with that of the liver, or to a change in the normal area of dulness without any disease of the liver itself.

A. Cases in which an unusual extent of hepatic surface is in contact with the abdominal or thoracic parietes.

1. Early life.
2. Congenital malformations and displacements.
3. Rickets.
4. Changes due to tight lacing.

B. To a tumour or collection of fluid in the vicinity of the liver, producing an area of dulness continuous with that of the liver; the principal of which are—

1. Diseases of the organs of the chest:
   - Pleurisy with effusion.
   - Empyæma.
   - Hydatids.
   - Aneurism.
   - Consolidated lung, and mediastinal tumours.
   - Pericarditis with effusion.
2. Tumours, or collections of fluid between the liver and diaphragm.
3. Abnormal conditions of abdominal viscera and parietes:
   - Collections of fluid in abdominal wall.
   - Aneurism.
   - Malignant disease in the region of the liver.
   - Fæces in colon.
   - Diseases of gall-bladder.
   - Hydatid, cystic, or malignant disease of kidney.

II. To an increased area of hepatic dulness, due to a diseased condition of that organ.

A. Those conditions in which the liver is enlarged, but the surface remains more or less smooth, and is not nodulated or lobular.

1. Amyloid liver.

2. Fatty liver.
3. Simple hypertrophy of liver.
4. Congestion of liver.
5. Interstitial hepatitis in all its forms.
6. Catarrh of bile-ducts, and other causes producing obstruction and retention of bile.

As it is only proposed to consider certain forms of tumour, the above Sub-class A will not fall within the limits of this paper.

B. Those diseases of the liver in which the surface is more or less lobulated or nodular.

1. Simple cyst.
2. Pyæmic abscess of the liver.
3. Tropical abscess of the liver.
4. Malignant disease in all its varieties.
5. Hydatid disease of the liver.

It is to this last Sub-class B, and more especially to the last-named disease, that this paper is specially devoted.

Class I.—Apparent Hepatic enlargements.

A, 1–4.—Such conditions of liver as are due to early life, congenital malformations and displacements, and rickets, must be diagnosed chiefly by the history of the case, and from their long duration without producing any marked change in the condition of the patient or any confirmatory evidence of hepatic disease.

Displacements of the whole or a portion of the liver by tight lacing must be diagnosed by the fact that it is most common in females. A distinct furrow in the liver-substance may sometimes be felt in those who habitually accustom themselves to a small waist, and, as in a case mentioned in this paper, lace off a portion of the liver-substance; this condition being accompanied by absence of marked evidence of hepatic disease.

B, 1.—The diagnosis of hydatid disease of the lungs, as also that disease of the kidneys, will be considered with the same disease in the liver. In diagnosing the cases of this group, careful attention must in the first place be given to the history of the case. The amount of dyspnœa is generally

much greater, in proportion to the amount of the dulness, if the disease is of pulmonary origin than if its primary seat is in the liver and it only bulges into the thorax. The history of previous pain, and expectoration with its character, must also be taken into account.

Mediastinal tumours may be suspected from their seat of origin, the pressure-signs they give rise to, and their chronicity; aneurism, by its bruit, pulsation, pain, and dyspnœa.

The greatest difficulty will arise with regard to pleurisy and empyema: in the former the upper margin of dulness is generally horizontal, and often varies with the position of the patient, in addition to which the bulging of the intercostal spaces is more general in pleurisy than in hydatid disease where it is more local; on the other hand, empyema is more likely to become circumscribed. The use of the aspirator would at once decide, by the character of the fluid withdrawn, the diagnosis between the two.

Dilated heart and pericarditis with effusion would be suspected chiefly from the history of the case and the seat; but it must be remembered that the diagnosis between the two is not always easy, as was shown by a case lately recorded in which a dilated heart was punctured by mistake, not only without harm, but with relief to the patient.

B, 2.—Bright and Murchison both mention cases of circumscribed peritoneal effusion between the liver and the diaphragm, but consider the diagnosis of such cases during life as almost impossible.

B, 3.—Collections of fluid in the abdominal parietes in the region of the liver present many points of resemblance to collections of fluid in the liver itself, as the following cases will show; but a careful attention to the history of the case and the absence of evidence of hepatic disease will materially assist in the diagnosis, and also noting accurately the most prominent point of the tumour, as well as the character of the fluid withdrawn as shown by chemical and microscopical examination.

Case I.

A. D., aged 6, admitted Nov. 16, 1874.

History.—Family history good. Has always been a strong, healthy child; but about two years ago had a fall from a wall, about eight feet in height, upon his abdomen, after which he complained of abdominal pain for a day or two; but has since been quite well till about two months ago, when his mother noticed that his body was enlarging.

State on admission.—In right epigastric region is a prominence, dull on percussion, commencing at umbilicus, and, extending upwards, becomes continuous with that of the liver, which reaches to the fifth costal cartilage; it measures five inches in its transverse diameter, and the same in its vertical. In the right nipple line the dulness does not extend below the costal cartilage; its most prominent point is to the left of the median line, but the dulness is not continuous with that of the spleen. A distinct thrill can be felt on percussion. It causes no pain, and attention was only directed to it by his clothes becoming too tight. The superficial veins are slightly prominent over the tumour. Apex of heart between fifth and sixth ribs. No evidence of ascites. Girth over most prominent part of tumour twenty-six and a half inches; right side, thirteen and a half inches; left side, thirteen inches.

Nov. 21.—Tumour punctured with the aspirator; about two ounces of rather thick ochre-coloured fluid and a large quantity of gas withdrawn. Fluid alkaline 1012, containing a large quantity of albumen; no trace of bile, hooklets, or echinocci could be found.

Discharged Dec. 14, 1874; tumour much less.

Re-admitted March 1, 1875, in a similar condition to the above.

Tumour aspirated. Twenty-seven ounces of similar fluid withdrawn.

April 18.—Ten ounces of similar fluid withdrawn by aspirator.

April 24.—Tumour again filled, and it was proposed to aspirate it again the following morning; but while taking his usual exercise he fell down in the hospital garden, upon his abdomen, and immediately complained of intense pain in abdomen. Seen half-an-hour after the accident. No tumour to be felt; pulse 130; temperature 102; respiration 36; bathed in a cold sweat; patient kept quiet in bed.

April 28.—Patient feeling quite well; no tumour to be felt; pulse and temperature normal: was discharged.

May 25, 1878.—Patient quite well; no tumour to be felt.

Case II.

E. A. I., aged 19, *admitted June* 2, 1873.

History.—Mother alive, but belongs to a phthisical family; had the usual diseases of childhood. In August, 1871, suffered from pain in back and loins, accompanied by slight yellowness of skin, shortness of breath, and night-sweats, and, for a time, emaciation. He recovered from this, and gained flesh, and continued well till September, 1872, when he had a return of his old symptoms for a time—he thinks about a fortnight—after which he continued well till his present illness. In April, 1873, he noticed a small, hard swelling just between the right hypochondriac and epigastric regions, which has been steadily increasing up to the present time, without giving any pain, redness, or throbbing. No history of injury.

State on admission.—No evidence of disease in any of the thoracic organs. Hepatic dulness begins one inch and a half below nipple, and extends downwards for six inches, being one inch below cartilages of ribs. At the inner and lower border of the ribs, on the right side, is a globular protuberance, measuring three inches in diameter; it does not extend beyond the median line, is elastic, but not red or tender. On relaxing the abdominal muscles, a fair grasp of the tumour may be obtained, and doubtful fluctuation felt. There appears to be some slight thickening of the superficial structures over the cartilages of the lower ribs; but at the outer border of the tumour the finger can to some extent be passed between it and the ribs. The tumour causes no pain. Tongue slightly creamy; bowels open regularly; no jaundice; urine 1025, acid; no albumen.

June 2.—A small trocar was passed into the tumour to a distance of two inches in an upward and backward direction. About two and a half ounces of healthy pus escaped; no cysts, hooklets, or laminated membrane, or trace of bile could be detected. A probe could be passed through the canula to a depth of three inches. Canula retained in the wound till June 9, when, the discharge becoming much less, it was withdrawn, and in a few days the wound closed.

June 21.—The tumour, which had again become tense and slightly painful, burst at the seat of the former puncture. There was a free discharge for a few days, and the cavity was washed out daily with a solution of carbolic acid; the amount of discharge daily decreased, and the wound closed.

August 18.—Discharged convalescent.

Case III.

M. A. K., aged 55, *admitted May* 3, 1873.

History.—About six weeks before admission, whilst lifting a heavy bed, was suddenly seized with pain in right iliac fossa; after which she noticed a swelling in that region, corresponding to the seat of pain, which has since increased, and for the last month has compelled her to keep her bed. She states that at one time she was very thin, but has become much stouter the last two or three years.

State on admission.—In right iliac fossa is a tumour the size of a fœtal head, the skin over which is red and tender. Fluctuation can be distinctly felt over the tumour. From its upper margin there is a dull area, five inches in width, extending upwards, to become continuous with the dulness of the liver, towards which it becomes rather wider. In other directions the hepatic dulness is normal. Extensive œdema of both legs.

May 3.—Tumour punctured by aspirator, and twenty ounces of fœtid pus removed. Patient died May 5.

Post mortem.—A large abscess was found in the abdominal wall in the right iliac region. The lower margins of the ribs were thrust inwards, causing a deep furrow in the liver-substance, and the dull band spoken of above was found to have no connection whatever with the tumour, but to be due to a portion of the liver which had become almost severed from the bulk of the gland, it only being connected by a pedicle.

I may also mention two other cases that have come under my observation of superficial collections of fluid over the liver.

One was a case of a bursa over one of the lower ribs, and the other of necrosis of the rib in the same region. The diagnosis was in both instances easy, from the fact that the most prominent part of the tumour was over the rib, and not over the intercostal space, and also from the history of the cases, or rather the occupation of the patients; the one with the bursa being a packman, the corner of whose pack was always rubbing against the point in question; the other patient was a joiner, who stated that from the time he first commenced his trade he generally struck his side, at the point in question, whilst using a plane; and I expect that a similar history would generally be found in these and similar cases to aid in their diagnosis.

Aneurism of the abdominal aorta or its branches, of sufficient size to be diagnosed during life, would be accompanied by the general signs of aneurism, such as pain, often severe and paroxysmal, tumour, frequently fusiform in shape, over which a bruit can generally be heard and pulsation felt in all directions; but it must be borne in mind that some cases of rapidly growing malignant disease are so vascular as to give rise to fluctuation, bruit, and pulsation. I am unable to find any record of an aneurism of the hepatic artery being diagnosed during life.

Malignant disease in the region of the liver would give rise to symptoms similar to those which will be mentioned when speaking of that disease in the liver itself.

Care must be taken, in all these cases, that you are not misled by an accumulation of fæces in the colon; but careful attention to and regulation of the bowels will generally decide this point.

Enlargements of the gall-bladder may be a source of difficulty in diagnosis, and must always be taken into account when the area of hepatic dulness is increased in this direction. It may be due to simple accumulation of bile from obstruction, suppuration, dropsy, accumulation of gall-stones, or cancer. In the first the fluctuating tumour in the region of the gall-bladder is accompanied by jaundice, absence of bile from the motions, and general enlargement and tenderness of the liver. In the second there is often a history of gall-stones; there is no jaundice, bile is present in the motions, no general enlargement of the liver; there is pyrexia, generally rigors and night-sweats. The third is a chronic catarrhal condition which has not gone on to suppuration, and is very likely to be confounded with hydatid disease till a portion of the fluid is drawn off. The fourth is of extremely slow growth, very hard but more or less movable, and gall-stones may often be felt to move on each other. In the last the tumour is more fixed, and more or less painful; it is generally accompanied by vomiting, progressive emaciation, and is more rapid in its growth; it may be primary, but is more often secondary.

The principal diseases of the kidney that are likely to

cause a difficulty in diagnosis are hydatids of the kidney, cancer of the kidney, hydro-nephrosis, pyo-nephrosis, and cystic disease of the kidney, in all of which it will be found that the dulness extends quite back to the lumbar region, and that there is no resonance between the dull area and the spine, and that the colon is in front of the tumour in question. The state of the urine should be carefully examined and enquired into, as in case there is any communication between the tumour and the ureter the whole or a portion of the contents of the tumour is sometimes voided periodically with the urine. The previous history of any renal affection, such as hæmaturia or calculus, would afford strong evidence of renal origin. All the above, with perhaps the exception of cancer, would give rise to a sense of obscure fluctuation; and in the latter the age of the patient would be some guide, as nearly one-third of the recorded cases were under five years of age. Its surface is generally indurated, the tumour itself fixed, and often accompanied by hæmaturia. Cystic disease of the kidney rarely attains to sufficient size to be diagnosed during life; but there are cases of its attaining to a considerable size in a third kidney, and the urine presenting no abnormal characters. Hydro-nephrosis is often congenital, and may be accompanied by other malformations, and its chief inconvenience is from its bulk. The withdrawal of the whole or a portion of its contents by the aspirator would decide the diagnosis, and avoid risk of rupture.

Class II.—True Hepatic Enlargements.

A.—Not within the limits of the present paper.

B 1. *Simple Cyst.*—I am unable to find any record of a case of simple cyst of the liver being diagnosed during life.

B 2. *Pyæmic Abscess.*—The enlargement of the liver, although considerable, is not generally very great, and its surface is less nodular than in cancer, and there is not as a rule a feeling of fluctuation. Pain and tenderness are always

present, and are markedly increased on deep inspiration. Jaundice is present in about four-fifths of the cases. Impediment to portal circulation, enlargement of the veins of the abdomen, and ascites are rare; but the spleen is generally enlarged. Pyrexia is always present, and varies much in its intensity at different times in the same case.

Rigors are usually present, and vary much in their intensity and in the intervals between them, and the oscillations of temperature are very sudden; profuse perspirations are generally present; emaciation is progressive, and diarrhœa common. Dry brown tongue and delirium generally end the case. The disease rarely lasts more than six months, but, according to the late Mr. De Morgan, it may last a year or more.

There must exist in the patient some source from which the putrefactive products of suppuration can be absorbed into the system, but it is not requisite that this should have direct communication with the exterior of the body.

B 3. *Tropical Abscess.*—Under the above head I include those cases of abscess of the liver which are generally of large size and single. There may, however, in rare cases be two or three, but they are never numerous and are of an idiopathic origin, having no connection with pyæmia, or, in other words, with small multiple abscess of the liver. The symptoms of this disease may be divided into those which take place before suppuration, and those which take place after suppuration.

Before suppuration.—During the first week or ten days the symptoms are mainly those of congestion of the liver, which yet has a smooth surface and is enlarged in all directions. There is remittent pyrexia, with a feeling of weight and oppression in the region of the liver. There is frequently slight jaundice, nausea, headache, dyspnœa, and dirty tongue, but no very acute pain: the urine is scanty, and loaded with urates, and often the earliest indication that you have incipient tropical abscess to deal with, and not malaria, is obtained from the fact that the case does not yield to quinine. The whole of the symptoms may, however, recede from this stage without going on to suppuration.

After suppuration.—The enlargement of the liver is no longer uniform, but the natural outline is changed by the projection of a smooth globular mass, in which fluctuation, more or less distinct, can generally be made out; and this obscurely fluctuating region is surrounded by a more or less well-marked hard indurated zone; if, however, the abscess is very deep, the sense of fluctuation may be wanting. The pain and tenderness are not generally very acute, but become more so as the pus approaches the surface. Ascites, enlargement of the spleen, and œdema of the lower limbs are not prominent symptoms, and jaundice is not generally persistent. Pyrexia is present at some period of the twenty-four hours. Rigors and profuse perspirations are not so well marked as in pyæmic abscess. There is generally loss of appetite, accompanied by obstinate vomiting, and a coated or red tongue.

The duration of the disease, before coming to a climax, may vary from two to three weeks to many months; and this is probably the explanation of the cases of this disease seen in this country. It is most common in India or China; rare in the West Indies; and generally occurs between the ages of 25 and 45, in persons of indolent habits, who either eat or drink to excess.

Case I.

The following case was in the Middlesex Hospital, under the care of the late Dr. Murchison, while I was a pupil of that institution:—

F. K., aged 39, *admitted Jan.* 5, 1871.

History.—He left Japan about sixteen months ago, and went to Madras; and while there he acknowledges that he was a free drinker, especially of gin. He landed in England in July, 1870. His health continued good for the first three months. He never had dysentery in India. In October, 1870, he noticed that he was losing flesh, and that his appetite was failing. For some weeks past he has suffered from night-sweats, and a month ago was obliged to give up work. About this time he noticed a swelling in the right hypochondriac region, which has since increased.

State on admission.—Patient is considerably emaciated, and complains of great weakness and loss of appetite. No cough.

Pulse 80. Temperature slightly raised. Auscultation and percussion show the thoracic organs to be fairly healthy. Lower ribs on the right side slightly everted, and hypochondriac region prominent. Hepatic dulness in the right nipple-line five and a half inches. Upper limit normal. Projecting from the lower surface of the liver, in the right epigastric and hypochondriac regions, can be felt a smooth elastic tumour, the size of a cocoa-nut; it is slightly tender, but gives no vibration. No jaundice. Bowels regular. Urine 1030, acid. No albumen.

Jan. 9.—Is weaker, and has more pain in tumour, which is enlarging. No rigors. Sweats profusely at night. Temperature 99° in the morning, and 103° in the evening. An exploratory trocar introduced into the tumour, which gave exit to pus. A large trocar was then introduced, and 30 ounces of brick-red pus let out. Cavity washed out with a solution of chloride of zinc, and canula retained in position. Wound dressed with carbolic oil. For some days after the operation the patient was much better, the night-sweats greatly decreased, and the temperature almost normal. After several days, the temperature again rising, the canula was withdrawn, and several ounces of dirty, but not offensive, pus escaped. A drainage-tube was now substituted for the canula, and the cavity washed out daily.

Jan. 18.—The drainage-tube appears to give a better exit to the pus than the canula, and the patient expresses himself as better. Pulse and temperature lower, and he takes his food fairly well.

Jan. 20.—Discharge slightly offensive for the first time.

Jan. 22.—Appetite not so good. Night-sweats and diarrhœa.

Jan. 24.—Discharge contains bile. Tube removed, and the wound kept open by lint. From this time the patient gradually lost ground; rigors and profuse night-sweats returned, accompanied by loss of appetite and troublesome diarrhœa.

He died on Feb. 4.

Post-mortem.—Extreme emaciation. On opening the thorax, the left lung was found to be adherent over a considerable extent, and there was a small quantity of fluid in the right pleura. Lungs otherwise healthy; walls of heart thin and flabby; liver extensively adherent to diaphragm and to abdominal wall for about two inches around the seat of puncture. The cavity, which was bounded by a well-marked wall of fibrous tissue, would not now contain more than 16 ounces. Scattered throughout the liver were several small

abscesses, without any well-defined wall. The intestine, which was carefully examined, presented no trace of ulceration or of old cicatrix. The mucous membrane was in some places rather congested, but no source of purulent infection could be found.

B. 4. *Cancer of the Liver.*—In this disease the enlargement is generally very great, and may be as much as seven times its normal weight; but it should be remembered that we somtimes find cancer in an already contracted liver. The onset of the disease is very insidious. The enlargement generally takes the form of nodules of various sizes scattered over its surface and throughout its substance, so that the surface is uneven and the nodule itself is often depressed in the centre. Rarely there is an obscure sense of fluctuation.

There is generally more or less pain, often severe and lancinating in character. Jaundice is generally present, and having once appeared never disappears. The temperature is normal, unless you have complications, and emaciation is progressive. Vomiting is a most troublesome feature in most cases. Ascites generally comes on towards the termination of the case, but not to any great amount. The superficial veins of the abdomen are not generally enlarged.

The early symptoms are those of deranged digestion, such as nausea, loss of appetite, vomiting, creamy tongue, constipation, and progressive emaciation.

It is often, and according to some authorities always, secondary to malignant disease of other organs, and it rarely lasts over a year from its first giving rise to marked symptoms.

Its diagnosis is aided by the circumstances under which it occurs. It is rare under thirty-five years of age. We often find a history of malignant disease in other members of the family; and here, as in malignant disease of other organs, it is by no means an uncommon feature to find a history of marked longevity in the ancestors and an unusually good previous history of the patient himself.

B. 5. *Hydatid Disease.*—Having thus briefly considered those conditions which are most likely to embarrass the diagnosis, we will now pass to the consideration of the

disease of the liver and its surrounding organs in which the aspirator is likely to be of the greatest use, namely, hydatid disease.

The leading characters of hydatids of the liver are—

The enlargement of the liver is painless at least in its early stages, the patient not being aware that he has any tumour in the hepatic region, or only having his attention directed to it by a feeling of weight there; hence it may attain to a considerable size before it is brought under notice.

The outline of the liver is changed, there being usually more or less protrusion either into the thorax or abdomen or a bulging of the lower ribs. The tumour is not hard, but elastic, often giving a sense of obscure fluctuation; and there is frequently hydatid thrill on percussion.

The surface of the tumour is smooth, but in some instances it may become lobulated.

Œdema of the feet and legs, with enlargement of the superficial veins of abdomen, is not usual in this disease; and the spleen is rarely enlarged.

Jaundice is rare, unless the tumour presses on the fissure of the liver.

It is rare for hydatids to give rise to renal derangements, unless they originate in the kidney, or rupture into that organ, or cause albuminuria by pressure. Their growth is generally very slow, and hence they may exist for years.

A hydatid cyst may attain to enormous size without attracting attention, but sometimes a small tumour will cause pain.

Constitutional symptoms are generally conspicuous by their absence, there being, as a rule, no pyrexia or derangement of the digestive functions. Cough is sometimes present in hydatids of the liver, and it is a prominent symptom when the disease originates in the lung.

Hydatid cyst of the liver may be confounded with most of the conditions already mentioned, and may even attain to such a size as to be confused with ovarian cyst.

Should it have its primary origin in the liver and extend through the diaphragm into the lung, and come in contact

with the thoracic wall, in addition to the cough already mentioned, we have the line of demarcation from absolute dulness with absence of breathing to normal percussion and respiration very abrupt indeed: if originating in the lung and located, as it often is, in the infra-clavicular region, it frequently gives rise to symptoms closely resembling those of phthisis. If it originates in the kidney, and it attains to a great size before it is seen, its diagnosis may be very difficult.

But in most instances the nature, if not the seat, of the tumour may be set at rest by a puncture, and the withdrawal of the whole or a portion of the contents by means of the aspirator. The normal hydatid cyst contains a clear limpid fluid, of alkaline or neutral reaction, having a specific gravity of 1007 to 1011, containing neither albumen nor urea, but a large quantity of chlorides; and if carefully examined by means of the microscope, we frequently find either small hydatid cysts or portions of laminated hydatid membrane or hooklets, all of which are characteristic of the parasite.

Should any inflammatory action have taken place in or near the cyst, the fluid is very likely to contain albumen.

But is this means of establishing the diagnosis free from danger? and, if not, what are its dangers, and what are the dangers of not establishing the diagnosis, and as a consequence of adopting no operative treatment? From the quotations in the early part of this paper, it appears that, with due precautions, a fine needle may without probable harm resulting be introduced into any organ of the body—even an aneurism or the heart itself; and in cases of malignant disease I have never seen any harm done by its use.

Still it will be seen from the following tables that the puncture of a hydatid cyst of the liver with a fine trocar has on more than one occasion been followed by rapidly fatal results; but I am not aware that a similar accident has ever followed the use of so fine a needle as is generally used with the aspirator, and, as the fluid is generally quite thin, there is no advantage in using anything but a very fine needle for exploratory purposes; one case, however, given in this paper will show that the fluid is not always of this character.

We will next consider what happens to hydatids that are not treated by operative measures.

They may undergo spontaneous cure, as is proved by finding the remains of hydatids after death in a shrivelled condition, containing hooks and portions of cyst-wall, in cases that have never been operated upon; but as these have not generally been diagnosed or suspected during life, and are of small size, their death is probably due to some chance inflammation in or near the cyst, or to the entrance of bile, due to a communication with a bile-duct.

If spontaneous cure does not take place, the cyst goes on increasing in size, pressing upon, invading, or displacing other organs, till it ruptures in one of the following directions, or causes death by pressure, viz.:—

Into the pleura or lung, giving rise to pneumonia, pleurisy, or empyæma, with or without expectoration of the whole or a portion of the cyst; and this, which is a very common course for hydatids of the liver, often ends fatally.

Into the pericardium, giving rise to rapidly fatal pericarditis.

Into the peritoneum, causing peritonitis, which, if the cyst is large, is generally rapidly fatal; the immediate cause of the rupture being generally an accident.

Through the abdominal parietes or intercostal spaces; but this is rather rare, especially in small cysts, so that by the time this takes place the cyst is of large size, and, as it of necessity takes on suppuration, it is very likely to exhaust the patient.

Into the stomach or intestine. Under these circumstances, the contents of the cyst are generally passed *per rectum;* this is the most favourable course the disease takes. In a case under my care some time ago, a patient who had been suffering for some time from a large fluctuating tumour in the region of the liver, supposed to be hydatid, and who refused all operative measures, was seized during the night with severe pains in the abdomen, and the next morning passed what was described to me as a large quantity of matter, containing what looked like grape-skins; this was accompanied by a

marked diminution of the tumour in the region of the liver, and the patient ultimately made a good recovery.

Into the urinary passages, especially if the primary disease is in the kidney—by no means an unusual seat.

Into the biliary passages, as is shown by the finding of bile in the fluid withdrawn by the aspirator; and there may be biliary colic from the impaction of a small cyst in the common or cystic duct.

Into the portal vein or vena cava inferior.

It may end fatally, by taking on suppuration and giving rise to pyæmia.

It may also give rise to secondary hydatids in the same or other organs.

Now the arguments used against puncture are—

That you may injure the organ in which the hydatid is situated.

That you will probably set up suppuration.

That you may cause sudden death from shock.

That you may puncture an artery, aneurism, bronchus, vein, malignant tumour, intestines, or stomach.

In answer to the first of these objections, Dieulafoy states that he has never seen an accident follow the use of the aspirator, that could fairly and reasonably be attributed to it; and this is supported by the tables already quoted.

S. Dougan Bird, of Melbourne, states that lung-tissue, and even a bronchus, may be punctured with a fine trocar without risk; and that this instrument is frequently used as an aid to diagnosis of hydatid disease of the lung, which is so common in that colony that he has himself seen 150 cases.

I have myself seen the aspirator introduced into the alimentary canal without any apparent harm to the patient.

With reference to the puncture of an aneurism or blood-vessel, some years ago, the late Mr. Moore deliberately punctured a thoracic aneurism, and introduced, through the canula of a fine trocar, a quantity of fine wire into the cavity of the aneurism, without any harm to the patient.

As to giving rise to suppuration, the following tables will show that this frequently takes place where no operation has

been performed ; so that even in those cases where it follows puncture it must not be concluded that it is always due to the operation.

As regards sudden death from shock, the following tables will show several instances, the most rapidly fatal being No. 14, Table I., in which it was found that a branch of the portal vein had been punctured ; and, in all, it was a fine trocar that was used, and not a very fine needle, such as is here advocated as an aid to diagnosis.

The tables will also show that the highest mortality was among those cases in which no operation was performed.

Having considered the liabilities to danger from rupture in various directions, and the high death-rate among those cases in which no operation was performed, and also considered the dangers attributed to the introduction of a fine needle, I am led to the conclusion that, in all cases of doubt, the needle should be introduced and the diagnosis confirmed ; and the nature of the fluid, if any, ascertained, and the case treated accordingly ; and this I would advocate, whatever be the seat of the supposed tumour.

Now what are the modes of treatment that have from time to time been adopted, and with what results have they been attended ?

They are—

Leaving the case to take its own course unchecked in any way, in the hope that it may undergo spontaneous cure.

To attempt to destroy the parasite by means of drugs administered by the mouth.

To remove the whole or a portion of the fluid by a fine trocar or aspirator, and close the wound.

To remove the fluid by means of a large trocar, and leave a free opening into the sac.

To open the sac, wholly or partially, by means of caustics, so as to secure adhesions to the abdominal parietes.

To treat the case by electrolysis or acupuncture.

With reference to leaving the case to take its own course, or treating it by drugs only, Table 7 shows that of 35 cases

there were 7 cures, 23 deaths, and 5 results not given—by far the highest death-rate of any of the tables.

With regard to drugs, Drs. Murchison, Dougan Bird, Harley, and many others are of opinion that they are perfectly useless ; and this is not more than would be expected when it found that, as in cases in the tables, after taking the most readily diffusible drugs, such as iodide of potassium, no trace of them is found in the contents of the cysts.

With regard to the removal of the fluid by large and permanent opening, it is shown by the following tables that it is always attended by prolonged suppuration and often fatal results ; so that it is, in my opinion, desirable to avoid this mode of treatment, if possible.

It is also seen that in a large number of cases the puncture with a fine trocar, and the withdrawal of the whole or a portion of the contents, and closure of the wound will produce the desired effect.

Caustics have no advantage over a large trocar, as they sometimes fail to produce adhesions ; and if the cyst is near the surface we generally have them already formed, and if it is deep seated we have still to puncture the portion of the organ intervening between the parietes and the cyst itself.

As regards the treatment by electrolysis or simple acupuncture, it will be seen from Table VI. that the results are all good ; but it must be borne in mind that the tumours were all of small size, and in young subjects, and hence in a most favourable condition for cure ; but even under these circumstances there was evidence of the escape of a portion of the contents into the peritoneum or pleura in some of the cases, and it will also be seen from Table III. that the contents of the cysts are in some instances more or less purulent at the first puncture. Now should a case of this nature be treated by electrolysis or acupuncture, and a portion of the contents of the cyst be forced into the peritoneal or pleural cavities, I cannot but think that it would, in all probability, be attended by fatal results.

It is not requisite to inject irritants into the sac, as the withdrawal of a portion of the contents is in most instances fatal to the parasite.

We now come to the consideration of the method of treatment by withdrawing the whole or a portion of the contents of the cyst by means of a fine trocar or needle of the aspirator; and the first point to consider is the time for the operation.

Now, as the introduction of a fine needle has been shown to be almost free from danger, and the longer it is delayed the larger does the cyst become, and hence more liable to contain more or less of a purulent fluid, I should advise that as soon as the tumour is fairly felt a fine aspirator-needle should be introduced with a view to establishing the diagnosis, and from the character of the fluid, if any is withdrawn, you can establish not only the diagnosis of hydatid disease, but obtain important information for your guidance in the future treatment of the case.

In the following tables, which contain 267 cases, the nature of the fluid at the first puncture is only given in the first three, which include 155 cases, these being all the cases in which its character at the first puncture is stated. Of these 155 cases there were 106 in which it was clear at the first puncture, and 49 in which it was more or less thick, purulent, or tinged with bile; and it is in this latter class that we find the highest mortality of those cases in which the character of the fluid is stated, namely, in 49 cases there were 26 cures, 20 deaths, and 3 results not given; but in 106 cases in Tables I. and II., in which it is stated to have been clear at the first puncture, there were 86 cures, 17 deaths, and 3 results not given—a far lower per-centage of deaths; and of these 106 cases there is no evidence given that suppuration ever took place in 71 cases, and of these 71 cases there were 58 cures, 11 deaths, and 2 results not given.

Now the inference that I would draw from these figures is that if the fluid, at the time of the first puncture, be quite clear, withdraw the greater part or the whole of it by means of the aspirator, and close the wound; but that if it is thick or purulent at once introduce a large trocar and leave the canula *in situ*, wash out the cavity once or twice daily, and if the opening becomes blocked, dilate it by means of catheters to facilitate the expulsion of the daughter-cysts, of course taking

care at no time to distend the cavity by injecting too large a quantity of the antiseptic fluid; it is also advisable to keep the abdomen, if this is the seat of the tumour, well bandaged, as it aids in the contraction of the sac.

And this line of treatment I would advocate whatever be the region of the thorax or abdomen in which the tumour is situated.

There are several cases in Harley's Tables, in which suppuration had taken place, that did not do well till a free opening was made. Of course Table IV., in which the nature of the fluid is not stated, cannot be considered with reference to the advisability of establishing a free opening from the first.

CASE I.

W. R., fireman, U. S. S. Teuton, April 14, 1877, *aged* 45.

Came up from stoke-hole complaining of cramping pains in his abdomen, which he stated had been troubling him on and off for some days. Bowels confined; pulse and temperature normal; no rigors or sweats at night. On careful examination of the abdomen, the lower margin of the liver is found to be irregular; dulness in the right nipple line extends three inches below the normal, extending almost to the umbilicus; the rest of the margin of the liver, both upper and lower, is normal. Over this dull area the abdominal wall is slightly prominent and tender. On relaxing the abdominal muscles, a hard but slightly elastic tumour, the size of a small cocoa-nut, can be felt. No thrill can be detected, but an indistinct sense of fluctuation can be made out; other organs apparently healthy: patient is emaciated; no jaundice or vomiting, but of a sallow complexion; rest of the surface of the liver appears to be smooth.

History.—No history of malignant disease. He has been a fireman for twenty-five years, and up to the present time has never been off duty for ill-health; but for several months has not felt so well up to his work as usual, and has lost flesh. He has been in the royal mail service, and consequently in the West Indies and Brazils, but has not been laid up with fever.

May 1.—The state of the patient has continued much the same since first note. No rise of temperature has ever been detected; no rigors or night-sweats; no pain in tumour, or vomiting. If there is any change in the tumour, it is slightly larger, and fluctuation more distinct. Sent to Somerset Hospital, Cape Town.

May 28.—On visiting the patient, I was informed that about a week ago he began to complain of rigors and night-sweats, the tumour becoming more tender. On 24th a small puncture was made into the tumour, and pus escaped in a small quantity; trocar withdrawn, and wound closed.

May 26.—Puncture with large trocar and 26 ounces of pus drawn off, containing hydatid cysts, and the wound again closed. He states that he has felt better since the operation. To remain in Hospital.

April 30, 1878.—Letter received from his wife, stating that he died a week after the "Teuton" left Cape Town.

Case II.

E. J., aged 29, admitted March 22, 1873.

History.—Has always enjoyed good health, till about six weeks ago, when she began to suffer from pain and a feeling of weight in the right side, which she thinks has since been enlarging.

State on admission.—Chest fairly formed; sibilus over both fronts; hepatic dulness commences two inches below nipple, and measures five and a half inches. In the median line it extends to within half-an-inch of the umbilicus, and is continuous with that of the spleen. Area of cardiac, dulness ill defined; sounds wanting in definition, dulness over the lower half of the right back, rather fine crepitation over the lower half of right back and extreme base of left back.

March 24.—Sweating freely at night.

March 31.—Complains of pain at the base of right lung and in right hypochondriac region, over which friction can be heard as low as the base of the costal cartilages in front.

April 4.—On examination to-day, the liver is found to be much enlarged, extending quite to the umbilicus, and the patient complains of a good deal of abdominal pain. On auscultation, a harsh to-and-fro sound can be heard below and to the left of the umbilicus.

April 5.—Right side of abdomen is found to be an inch and a half larger than the left. Right side of liver can easily be made out, but the left is not so easily defined. Liver has an elastic feeling, but no distinct fluctuation.

April 9.—Right side of abdomen still increasing in size, and the patient has a drawn and anxious expression. Liver punctured with aspirator three inches to the right of median line, and one inch below costal cartilages, and pus discovered, by Mr. Lawson. A large trocar

was immediately introduced, and forty-six ounces of very offensive thick pus came away, which contained numerous small hydatid cysts and many pieces of laminated hydatid membrane. An elastic catheter could be passed into the opening to within two inches of its entire length. Cavity washed out with Condy's fluid, and the canula retained *in situ*.

April 10.—Considerable discharge during the night; cavity washed out with carbolic acid.

April 15.—Still considerable amount of discharge. The canula having a tendency to fall out, and its point being directed upwards, it was removed, and the canula of a prostatic trocar introduced in its place. Discharge to-day contained some bile.

Patient continued to make fair progress till April 26, when she had a slight rigor; but the temporary removal of the tube and the withdrawal of a large-sized cyst, which was blocking up the opening, gave great relief.

Numerous cysts came away at different times, and the cavity was washed out daily, the discharge gradually becoming less. The canula was withdrawn, and the wound allowed to close; and on May 13 she was discharged convalescent, the liver not extending below the ribs.

April 13, 1878.—Has continued quite well since her discharge from the Hospital. No tumour to be felt.

Case III.

G. H., aged 35.

History.—Has always enjoyed good health, with the exception of occasional attacks of pain in the right hypochondriac region, which, on one or two occasions, obliged him to give up work for a day or two, one of which was accompanied by slight jaundice. Has always been of temperate habits. Mother and two maternal aunts died of cancer.

Present state.—He is fairly well nourished. Margin of the liver can be distinctly felt 3 inches below the costal cartilages; and midway between the costal cartilages on the right side and the umbilicus are two roundish prominences, an inch and a half in diameter, in both of which obscure fluctuation can be felt. There is no redness or tenderness on pressure. The liver-dulness is not increased upwards, either in front or at the back. No jaundice, and the stools are of a natural colour. No discomfort after food. Thoracic organs appear fairly healthy. Urine 1026, acid. No albumen.

Jan. 20, 1878.—Puncture made with the aspirator in each of the protuberances to a depth of from 3 to 4 inches, when only a few drops of a semi-sanguino-purulent fluid escaped into the aspirator. Operation caused no discomfort, and the patient, who declined any further operative measures, went to work the following day. Fluid examined by Drs. Payne, Buzzard, and Coupland. No trace of laminated membrane or hooklets, or marked cell-growth or degeneration, could be found.

Nov. 5, 1878.—Patient got wet through, and was laid up with an attack of bronchitis. Complains of increased weight in his side, the girth of which has increased an inch; and his breathing became so distressed as to compel him to pass his nights in a chair.

Jan. 16, 1879.—Fluctuation having become more distinct in the above-mentioned prominence, a puncture was made with a small trocar, when only a few drops of purulent fluid escaped into the canula.

Jan. 22.—A large abdominal trocar was introduced, and by means of probes and catheters a large quantity of matter resembling sago pudding was extracted, the quantity of which for a long time daily increased, the opening being, at the same time, steadily increased by means of catheters; and on one occasion the patient thinks as much as two pints escaped at once. So extensive was the cavity that an ordinary catheter could be introduced for its entire length. During this time he was seized with a violent fit of coughing, and expectorated a large quantity of the same sort of material. This condition continued for many weeks, during which time he was wearing a piece of drainage-tube in the wound, but was obliged to wear the end tied up, only opening it to allow the periodical escape of pus, and the cavity to be washed out with an antiseptic. When the wound or the end of the tube was open, he used to breathe through it, and this caused great pain. Many pieces of hydatid membrane escaped in the expectoration and discharge, but no small cysts were ever seen.

Case continued to improve; and at the end of June, 1879, the tube being no longer able to be kept in the wound, and the discharge having almost ceased, it was discontinued, and the wound rapidly closed.

Sept. 14, 1879.—Patient expresses himself as perfectly well. No remains of tumour; liver dulness normal.

Case IV.

F. R., aged 36, admitted May 13, 1873.

History.—Was in hospital in 1867 with hydatid cyst in liver, which was punctured, and 148 ounces of fluid withdrawn. After this she continued well till 1869, when she had a return of her old feeling of weight in the hepatic region, which has since steadily increased; and in 1871 she first noticed two small lumps just below the costal cartilages of the right side.

State on admission.—A well-nourished woman. There is marked bulging of the side of the abdomen and thorax. Immediately below the costal arch on the right side is felt a firm resisting body, giving an elastic sensation to the fingers; it is the seat of a dragging pain, and is continuous with the hepatic dulness. Heart's impulse beating in the left axilla; dulness to angle of right scapula behind; bronchial breathing over the dull area to angle of scapula.

May 31.—Trocar introduced just under right costal cartilages, 2 inches to the right of median line, and 6 ounces of clear hydatid fluid drawn off; contained a small quantity of albumen. Patient was very faint after the puncture.

June 28.—Tumour again punctured, and two ounces of blood drawn off.

July 17.—Again punctured, and 2 ounces of pus and blood drawn off. After this the tumour was several times punctured with various-sized trocars, but on no occasion was there any large amount of fluid drawn off. The wound was kept open at different times for several days; but as there never appeared to be a free discharge, it rapidly closed.

Sept. 9.—Wound enlarged by bistoury, the patient having had several rigors, and 30 ounces of offensive fluid drawn off. Cavity washed out daily. She gradually became worse, and died on Sept. 19.

Post-mortem.—The sinus mentioned above was found to pass in an upward and a backward direction, and the liver to extend 5 inches below the costal cartilages. On examining the thorax, the heart was pushed quite over to the left side, and the right lung, which was very much compressed, occupied only the upper part of the right side of the thorax, not extending below the fourth interspace either back or front; the space between the lower part of the lung and the upper surface of the liver, a distance of about 8 inches, was occupied by the remains of an old hydatid cyst, which had destroyed the diaphragm on this side and also the greater part of the right

lobe of the liver. It communicated with the exterior by means of the sinus made by the trocar. The opening into the sac, which was near its lower border, was covered by a valve-like fold of the thick fibrous membrane which everywhere lined the cavity.

Below this cyst in the right lobe of the liver, and separated from it by a thick layer of fibrous tissue, was a cyst the size of a duck's egg, containing closely packed shreds of hydatid membrane.

Table showing the number of Cases in each Sex in each of the accompanying Tables.

	Males.	Females.	Sex not given.	Total.
Table I.	35	33	3	71
,, II.	12	23	—	35
,, III.	25	23	1	49
,, IV.	14	13	11	38
,, V.	21	6	3	30
,, VI.	4	5	—	9
,, VII.	19	14	2	35
	130	117	20	267

Table showing the number of Cases in each period of 5 Years from Birth to 75 Years of Age in the accompanying Tables.

Periods of 5 Years.	Tables I.	II.	III.	IV.	V.	VI.	VII.	Total.
Birth to 5 years ...	1	—	—	1	—	2	—	4
5 to 10 ,, ...	4	2	1	2	1	4	—	14
10 ,, 15 ,, ...	5	2	2	2	2	1	1	15
15 ,, 20 ,, ...	9	6	5	—	2	1	4	27
20 ,, 25 ,, ...	9	3	5	1	2	—	1	21
25 ,, 30 ,, ...	9	5	8	7	3	1	3	36
30 ,, 35 ,, ...	12	7	6	4	3	—	4	36
35 ,, 40 ,, ...	4	6	5	1	5	—	5	26
40 ,, 45 ,, ...	5	—	3	1	—	—	3	12
45 ,, 50 ,, ...	5	—	2	3	1	—	2	13
50 ,, 55 ,, ...	—	—	—	1	—	—	3	4
55 ,, 60 ,, ...	—	1	4	2	1	—	2	10
60 ,, 65 ,, ...	—	—	1	1	2	—	—	4
65 ,, 70 ,, ...	—	—	—	—	—	—	—	—
70 ,, 75 ,, ...	—	—	—	—	—	—	1	1
Age not stated ...	8	3	7	12	8	—	6	44
Total	71	35	49	38	30	9	35	267

Table showing the number of Cures and Deaths in each Sex in each of the accompanying Tables.

	Cures.	Deaths.	Result not given.	Total.
TABLE I.				
Males	28	6	1	
Females	29	3	1	
Sex not given ...	1	2	0	
	58	11	2	71
TABLE II.				
Males	11	1	0	
Females	17	5	1	
Sex not given ...	0	0	0	
	28	6	1	35
TABLE III.				
Males	13	10	2	
Females	13	9	1	
Sex not given ...	0	1	0	
	26	20	3	49
TABLE IV.				
Males	12	1	1	
Females	12	1	0	
Sex not given ...	9	0	2	
	33	2	3	38
TABLE V.				
Males	12	9	0	
Females	4	1	1	
Sex not given ...	3	0	0	
	19	10	1	30
TABLE VI.				
Males	4	0	0	
Females	5	0	0	
Sex not given ...	0	0	0	
	9	0	0	9
TABLE VII.				
Males	5	11	3	
Females	2	11	1	
Sex not given ...	0	1	1	
	7	23	5	35
				267

The following is the classification adopted in the accompanying Tables :—

TABLE I.—Cases punctured by a small trocar and the wound closed, in which there is no evidence that suppuration ever took place.

TABLE II.—Cases punctured by a small trocar and the wound closed, in which the fluid was clear at the first puncture but subsequently became purulent.

TABLE III.—Cases punctured by a small trocar, in which the fluid was purulent, thick, or discoloured at the first puncture.

TABLE IV.—Cases punctured by a small trocar, in which the character of the fluid at the first puncture is not stated.

TABLE V.—Cases treated by caustics, incisions, or caustics and incisions, an opening of considerable size having been maintained from the first.

TABLE VI.—Cases treated by electrolysis or acupuncture.

TABLE VII.—Cases treated by drugs only, not operated upon, not diagnosed during life, or allowed to rupture spontaneously.

NOTES.

In all cases in which at the reference given the quantity of fluid removed is given to a fraction of an ounce, that fraction has been discarded.

In some cases the data given are not all obtained from the reference quoted, as many of the cases are published in several journals and not precisely in the same terms.

Fluid spoken of by the various authors as limpid or hydatid has been considered as clear and non-purulent; and that spoken of as thick or turbid has been considered as purulent.

Cases in which reference is given to other sources than those stated at the beginning of the Tables are cases to which reference is made in one of the sources named, and they are here referred to the original publications.

From the fact that many of the cases in these Tables have already been published in several places, it has not been an easy matter to avoid quoting the same case twice, and should any case have been so quoted it has been unintentional.

Reference has in most instances been made to the physician, and not to the operating surgeon.

The subsequent Tables have been collected from the following sources, viz. :—

Medico-Chirurgical Society's "Transactions," volume 49. Paper by Dr. John Harley on Hydatids of the Liver, with Tables.

"Lectures on Diseases of the Liver," by Dr. Murchison.

"British Medical Journal," since 1866.

"Lancet," since 1866.

"Medical Times and Gazette," since 1866.

Pathological Society's "Transactions," since 1866.

Clinical Society's "Transactions" since 1866.

TABLE I.

Cases punctured by a small trocar, and the wound closed, in which suppuration never took place.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	M.	8	Fine trocar, wound closed	6 oz. clear, chlor., no alb.	Feverish after operation ...	Cure ...	Murchison, p. 94
2	M.	14	Fine trocar, wound closed	23 oz. alk., no alb., clear	No tumour when last seen ...	Cure ...	Phillipson, B. M. J., Oct. 31, 1874
3	M.	16	Aspirator	22 oz. clear, echinocci ...	Vomiting	Cure ...	Bradbury, B. M. J., Nov. 18, 1876
4	M.	24	Fine trocar, wound closed	53 oz. clear, chlor., hooks, no alb.	Still in Hospital, doing well	... ...	Southey, B. M. J., Aug. 6, 1870
5	M.	25	Very fine trocar, wound closed a week later	21 oz. clear, chlor., 10 oz. pale, hooks and alb.	Slight fever after operation ...	Cure ...	Greennow, P. S. T. v. 18
6	M.	27	Fine trocar, wound closed	28 oz. clear	Two rigors after operation ...	Cure ...	Daffin, C. S. T., v. 6
7	M.	28	Repeated aspirations and galvanism	Small quantity, hooks, no pus	Excessive pain after galvanism	Death ...	Evart, B. M. J., Mar. 24, 1877
8	F.	23	Fine trocar, wound closed	114 oz. clear	... ...	Cure ...	McGillivray, Aust. Med. Jour., March, 1867
9	F.	11	Fine trocar, wound closed	18 oz. clear	... ...	Cure ...	McGillivray, Aust. Med. Jour., March, 1867
10	M.	29	Fine trocar, wound closed	16 oz. clear, hooks ...	... ...	Cure ...	Sympson, B. M. J., April 30, 1870
11	M.	34	3 cysts, 3 punct., fine trocar, wound closed	4 oz., 7 oz., 1 oz. clear, no alb., chlor., hooks	Probably 3 distinct cysts ...	Cure ...	Murchison, p. 99
12	M.	34	2 punctures, fine trocar, wounds closed	60 oz. clear, 40 oz. ...	Slight peritonitis after second puncture	Cure ...	Fenwick, B. M. J., July 22, 1876
13	M.	36	Fine trocar, wound closed	16 oz. clear, chlor., no alb.	... ...	Cure ...	Murchison, p. 96

14	M.	40	Pot. iod., small trocar, wound closed	9 oz. clear	Immediately after operation face flushed, pain in face and jaws, vomiting, epileptiform attack, death 5 minutes, punct. branch of portal vein	Death ...	Bryant, C. S. T., v. 11
15	M.	45	Fine trocar, wound closed 1 year after, fine trocar wound closed, paracentesis abdom.	1 dr. clear, no hooks ... 28 oz. hydatid, no alb. ...	Several tumours, died suddenly some weeks after operation. *P. M.* nothing to account for sudden death	Death ...	Murchison, p. 102.
16	M.	46	Exploratory, 2 punct. and injection of iodine	several oz. pale and hooks	Iodism after each injection ...	Cure ...	Skoda, B. M. J., Oct. 10, 1868
17	M.	50	Small trocar, wound closed	64 oz. clear and hydatids	... ...	Cure ...	Johnson, Clin. Soc. Trans., v. 6
18	—	31	Very fine trocar, wound closed	Small quantity clear ...	Faint, vomiting, 20 minutes	Death ...	Martineau, Lancet, Aug. 28, 1875
19	F.	6	Fine trocar, wound closed	14 oz. clear, chlor., no hooks	Tumour much less 3 months after	Cure ...	Murchison, p. 91
20	F.	6	Pot. iod., grooved needle, fine trocar, wound closed	7 oz. clear, no alb., no hooks	Born in Australia	Cure ...	Anstie, Lancet, Aug. 13, 1870
21	F.	14	Kamela electrolysis, 2 aspirations	2 oz. clear	Seen 3 months after operation	Cure ...	Jones, T. & G., April 18, 1874
22	F.	20	Aspirator	100 oz. clear, chlor., no alb.	Blood at end of operation ...	Cure ...	Heaton, B. M. J., Oct, 31, 1874
23	F.	20	Fine trocar, wound closed	4 oz. limpid, hooks ...	Pain, sickness, and urticaria...	Cure ...	Ransom, B. M. J., Sept. 28, 1872
24	F.	21	Fine trocar, inj. filicis maris, wound closed	4 oz. clear, hooks, no alb.	Vomiting and purging after operation	Cure ...	Pavy, Med. Chi. Soc. Trans. Sept. 29, 1866
25	F.	21	Fine trocar, wound closed	13 oz. clear, chlor., no alb., no hooks.	Urticaria tumour still felt ...	Cure ...	Ransom, B. M. J., Sept. 28, 1872
26	F.	23	Aspirator	16 oz. clear, chlor., no alb.	Redness of skin of abdomen and back	Cure ...	Paget, B. M. J., Oct. 31, 1874
27	F.	23	Pot. iod., grooved needle, KHO med. trocar, wound closed.	40 oz. clear, and hooks...	Seen several times after ...	Cure ...	Heaton, B. M. J., April 3, 1869
28	F.	25	Fine trocar, wound closed	40 oz. clear, chlor., no alb.	No tumour 4 years after	Cure ...	Murchison, p. 93
29	F.	26	Fine trocar, wound closed	21 oz. hydatid	Seen 6 months after	Cure ...	Duffin, Clin. Soc. Trans., v. 6

TABLE I.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
30	F.	29	Fine trocar, wound closed; abdominal trocar and section	1 oz. clear, chlor., no alb.	Hydatid tumours of liver and peritoneum, part removed by Spencer Wells, 9 months after	Death ...	Murchison, p. 106
31	F.	29	Aspirator	6 oz. clear, no alb. ...	Seen some time after... ...	Cure ...	Bradbury, B. M. J., Mar. 15, 1879
32	F.	30	Fine trocar, wound closed	148 oz. clear, chlor. and hooks	Slight fever after operation ...	Cure ...	Greenhow, Path. Soc. Trans., v. 18
33	F.	31	Potassium iod., fine trocar, wound closed	12 oz. clear, no alb., no pot. iod.	Febrile disturbance and ret. ur.	Cure ...	Murchison, p. 89
34	F.	31	Fine trocar, wound closed	20 oz. limpid, chlor., no alb.	Small tumour still to be felt 3 years after	Cure ...	Murchison, p. 93
35	F.	32	Aspirator	16 oz. clear	Vomiting and pain in head after operation	Cure ...	Bradbury, B. M. J., Nov. 7, 1874
36	F.	43	Several tumours, aspirator, several punctures, injection iod.	Clear, chlor., alb., no echin.	... ...	Cure ...	Alexander, Lancet, Feb. 20, 1875
37	M.	5	3 cysts, fine trocar, wound closed	20 oz., 20 oz., 10 oz., clear	3 cysts punc., none refilled ...	Cure ...	McGillivray, Aust. M. J., Mar. 1867
38	M.	6	Fine trocar, wound closed	2 oz. clear	... ...	...	McGillivray, Aust. M. J., Mar. 1867
39	M.	17	Fine trocar, wound closed	70 oz. clear	... ...	Cure ...	McGillivray, Aust. M. J., Mar. 1867
40	M.	18	Fine trocar, wound closed	10 oz. clear	Adelaide Hospital	Cure ...	Whittel, Lancet, Oct. 15, 1870
41	M.	20	Fine trocar, wound closed 2 punctures	45 oz. clear, chlor., hooks 35 oz., no alb.	... ...	Cure	Scott Orr, Glas. Med. Jour., Jan. 1876
42	M.	31	Fine trocar, wound closed	A few grammes clear ...	Sudden collapse after operation, no sign of peritonitis, 20 min., reflex paralysis of sympath.	Death ...	Martineau, Lon. Med. Rec., July 23, 1875

43	M.	45	Fine trocar, wound closed, 2 punctures	180 oz. clear ... ... 100 oz.	Second punct. 6 weeks after first	Cure ...	McGillivray, Aust. M. J., Aug. 1865
44	M.	46	Fine trocar, wound closed	120 oz. clear	Fluid tinged with bile	Cure ...	Frerichs, v. 2, p. 268
45	—	—	Fine trocar, wound closed	14 oz. clear	... ...	Cure ...	Hett, Lancet, Feb. 18, 1871
46	F.	19	Fine trocar, wound closed	20 oz. clear	Punctured below umbilicus ...	Cure ...	Harley, No. 17
47	F.	20	Medium trocar, wound closed	60 oz. clear	No return 3 years after ...	Cure ...	Harley, No. 6
48	F.	21	Fine trocar, wound closed, injected male fern	4 oz. clear	Seen 6 years after	Cure ...	Harley, No. 34
49	F.	28	KHO and puncture, wound closed	40 oz. clear	Slight febrile disturbance, portion of tumour remaining	Cure ...	Harley, No. 32
50	F.	30	2 cysts, fine trocar, wounds closed; 2 and 3 operations, no result	60 oz. clear	Jaundice, rigors, peritonitis, cysts in peritoneum, ascites before operation	Death ...	Harley, No. 15
51	F.	31	Fine trocar, wound closed	12 oz. clear	Second cyst not punctured, burst into lung; relief for time, death 2 months after operation	Death ...	Harley, No. 25
52	F.	33	Trocar, size 4 catheter, wound closed	40 oz. clear	Slight tympanitis, portion of tumour remaining	Cure ...	Harley, No. 20
53	F.	35	Fine trocar, wound closed	4 oz. clear	No remains 3 months after operation	Cure ...	Harley, No. 18
54	F.	36	Trocar, size 3 catheter, wound closed	60 oz. clear	No return in 3 years	Cure ...	Harley, No. 21
55	F.	—	Fine trocar, wound closed	Small quantity, clear, no alb.	Slight peritonitis	Cure ...	Harley, No. 12
56	F.	—	Fine trocar, wound closed	80 oz. clear	... ...	Cure ...	Harley, No. 14
57	F.	—	Medium trocar, wound closed	320 oz. watery	Refilled for a time	Cure ...	Harley, No. 8
58	F.	—	Exploratory trocar, wound closed	Clear	No result given	...	Harley, No. 29
59	—	—	Two cysts, one punctured, wound closed	160 oz. watery	... ...	Cure ...	Harley, No. 9
60	M.	12	Flat trocar, wound closed	30 oz. clear	Only one cyst, punctured. Much exhausted prior to operation; relieved by operation	Death ...	Harley, No. 5
					No constitutional disturbance	Cure ...	

TABLE I.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
61	M.	14	Medium trocar, wound closed	60 oz. clear	... ...	Cure	Harley, No. 7
62	M.	20	Cap. trocar, wounds closed	20 oz. clear	... ...	Cure ...	Harley, No. 37
			Four months after ...	15 oz.			
63	M.	34	Caustics, fine trocar, wound closed	Limpid	Refilled in 3 days; due to tetanus on 25th day	Death ...	Harley, No. 19
64	M.	35	Grooved needle	1 oz. clear	No trace of tumour 3 months after	Cure ...	Harley, No. 26
			Six weeks after, ordinary trocar, wound closed	23 oz. clear			
65	M.	37	Cap. trocar and inj. iod., wound closed	30 oz. clear	Iodism, portion of tumour remained 3 months after, doing well	Cure ...	Harley, No. 27
66	M.	37	Cap. trocar and inj. iod., wound closed	25 oz. clear	Slight rem. 1 month after ...	Cure ...	Harley, No. 33
67	M.	42	Fine trocar, wound closed	12 oz. clear	Very prostrate prior to operation; syncope, collapse, and vomiting. Second cyst contained 9 pints of fluid	Death ...	Harley, No. 16
68	M.	46	Fine trocar, wound closed	20 oz. clear	No bad effects	Cure ...	Harley, No. 36
			6 days after, large trocar, wound closed	No fluid			
69	M.	46	Small trocar, wound closed	120 oz. clear	Rigors and slight febricular disturbance	Cure ...	Harley, No. 22
70	M.	—	Exploratory, wound closed	Clear	Never reappeared	Cure ...	Harley, No. 28
71	M.	—	Ordinary trocar and syringe, wound closed	150 oz. clear	Tumour reduced; liver still large	Cure ...	Harley, No. 1

TABLE II.

Cases punctured by a small trocar, and the wound closed, in which the fluid was clear at the first puncture, but subsequently became purulent.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	M.	18	Aspirator...	25 oz., no alb. or hooks, clear	No trace of tumour when last seen	Cure ...	Bradbury, B. M. J., Mar. 15, 1879
			Puncture	11 oz. thick and alb. ...			
2	M.	26	Fine trocar, wound closed	Clear	3 cysts besides the one punct.	Death ...	Wiltshire, Lancet, Sept. 1, 1860
			Several punctures ...	Purulent	Due to pressure		
3	M.	30	Small trocar, wound closed	85 oz. clear, no alb., no hooks	Liver still large	Cure ...	Fearn, B. M. J., Nov. 7, 1868
			4 months after, large trocar, inj. iod.	40 oz. turbid			
4	M.	32	Multiple cysts, fine trocar, wound closed	11 oz. clear	... ...	Cure ...	Johnston, Clin. Soc. Trans., v. 6
			2 months, large trocar, wound open, injection	Pus and hydatids			
5	M.	35	Fine trocar, wound closed	24 oz. clear, chlor., no alb.	Albuminuria before operation	Cure ...	Bradbury, B. M. J., Oct. 17, 1874
			1 month, free opening and injection	Pus and hydatids			
6	M.	36	Aspirator...	40 oz. clear	Seen several months after ...	Cure ...	Bradbury, B. M. J., Nov. 18, 1876
			2 months after, aspirator	30 oz. pus-like			
7	M.	40	Several cysts	60 oz. clear	Very much discharge ...	Doing well	Richards, Lancet, Sept. 8, 1866
			Several punctures ...	Purulent			
8	F.	18	2 cysts, fine trocar, wound closed	38 oz. clear, chlor., no alb.	2 cysts, cirrhosis, and jaundice	Death ...	Scott Orr Glas. Med. Jour., Jan., 1876
9	F.	12	Fine trocar, wound closed	Suppuration at *P. M.* ...	1 pus, 1 greenish, 26th day ...	... ...	
			Free & permanent opening	30 oz. clear	... ...	Cure ...	McGillivray, Aust. Med. J., Mar. 1867
				Suppuration			
10	F.	8	Fine trocar, wound closed	20 oz. clear	Doubtful whether sec. puncture was into same cyst	Cure ...	McGillivray, Aust. Med. J., Aug. 1865
			Free & permanent opening	Suppuration			

TABLE II.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
11	F.	14	Aspirator, 2 punctures ... Large trocar, wound open	2 oz. clear ... ... 11 oz. thick	Many cysts, expectorated hydat.	Cure ...	Parson, Lancet, Dec. 20, 1879
12	F.	17	Small trocar, wound closed Trocar, 8 catheter, wound open and enlarged	1 dr. clear, no alb. ... 26 oz. purulent	No bad symptom after free operation	Cure ...	Rees, Path. Soc. Trans., v. 17
13	F.	19	Aspirator, 2 punctures ... Incision and injection ... Drainage-tube	Clear and chlor. ... Sanious	... ...	Doing well	Broadbent, B. M. J., Nov. 30, 1878
14	F.	21	Aspirator... ... ... Aspirator & drainage-tube	60 oz. clear ... ... 180 oz. opaque and yellowish	Several cysts in liver & perit. 48 hours after operation	Death ...	Murchison, p. 100
15	F.	23	Small trocar, wound closed Large trocar and free opening	6 oz. clear ... ... 12 oz. turbid and hydatids	... ...	Cure ...	Brook, Lancet, Feb. 1, 1868
16	F.	25	Fine trocar, wound closed 6 months after, fine trocar	33 oz. clear album. ... 72 oz. turbid	Jaundice after operation ...	Doing fairly	Ransom, B. M. J., Sept. 28, 1872
17	F.	29	2 cysts, fine trocar ... 9 days after, fine trocar	2 dr. hydatid ... ... 23 oz. opalescent, hooks	... ...	Cure ...	Duffin, Clin. Soc. Trans., v. 6
18	F.	32	Fine trocar, wound closed Vienna paste, fine trocar Large trocar and incision	60 oz. limpid ... ... Pus	Rigors and night-sweats. Seen 5 years after	Cure ...	Murchison, p. 97
19	F.	36	Same case, as 32, Table I	... ...	... ...	Death ...	Greenhow & Balding, Paper case IV.
20	F.	39	Fine trocar, wound closed 14 days large trocar, wound open Injections	1 oz. clear ... ... Pus	Vomiting and rigors	Cure ...	Duffin, Clin. Soc. Trans., v. 6
21	F.	39	Kamela, small trocar, wound closed Large troc. & free opening	60 oz. clear, no hooks ... Large quantity offensive	Urine dark green during injection of carbolic acid, seen 1 year after	Cure ...	Sympson, B. M. J., April 30, 1870

22	F.	—	Grooved needle and large trocar, wound open Injections	20 oz. clear ... ... Suppuration	... ...	Cure ...	Humphry, B. M. J., Nov. 7, 1874
23	M.	30	Exp. puncture ... ... Caustics, incision, injections	Watery ... ... 35 oz. turbid	Vomiting and feverish ...	Cure ...	Harley, No. 66
24	M.	31	Capil. trocar, wound closed Many punctures and injections Wound closed after each	12 oz. clear ... ... Turbid and sanious	Liver large 6 months after ...	Cure ...	Harley, No. 47
25	M.	31	Exp. trocar, wound closed Small trocar ... ... Free opening	38 oz. clear ... ... 10 oz. pus 39 oz. pus	... ...	Cure ...	Harley, No. 48
26	M.	36	Small trocar ... ... Incision	10 oz. clear ... ... 80 oz. brownish	No complication	Cure ...	Harley, No. 49
27	M.	—	Fine trocar ... ... Vienna paste and fine trocar	Clear ... ... Turbid	Feverish after second puncture	Cure ...	Harley, No. 46
28	F.	8	Cap. trocar .. ... Medium trocar Large trocar and incision	20 oz. clear ... ... Suppuration	Did not do well till free opening	Cure ...	Harley, No. 67
29	F.	17	Incision to peritoneum, flat trocar, wound closed 10th day, free opening	40 oz. watery ... . Turbid	Fever followed puncture ... Died of phthisis 5 months after operation	Death ...	Harley, No. 77
30	F.	19	Cap. trocar wound closed 23rd day, free opening ...	4 oz. clear ... ... 6 oz. foetid	Rigors after each puncture ... Seen 2 months after	Doing well	Harley, No. 51
31	F.	27	Explor. trocar ... ... Caustics, incision, injection, free opening	80 oz. clear ... ... 80 oz. reddish	Vomiting after injections ...	Cure ...	Harley, No. 69
32	F.	34	Small trocar ... ... Caustic, incision, free opening	160 oz. clear ... ... Pus	Feverish till free opening ...	Cure ...	Harley, No. 72
33	F.	34	Fine trocar, wound closed 9 weeks exploratory ... KHO and medium trocar Wound open 24 hours	6 oz. clear ... ... 6 oz. 10 oz. pus	Rigors after puncture ...	Cure ...	Harley, No. 45

TABLE II.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
34	F.	53	Vienna paste, small trocar Large trocar, injection, free opening	Clear ... ... 70 oz. yellow	Ulceration of intestine ...	Death ...	Harley, No. 74
35	F.	—	Fine trocar	6 oz. clear ... ... Followed by suppuration	... ...	... ...	Quoted in paper by Duffin, Clin. Soc., Trans., v. 6

TABLE III.

Cases in which the fluid was purulent, thick, or discoloured at the first puncture.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	M.	10	Kamela exploratory puncture Aspiration ... ... Free opening	Turbid, pus and blood ... 60 oz. offensive	Probably 2 cysts	Cure ...	Jones, T. & G., Ap. 18, 1874
2	M.	16	Small trocar, wound closed Free opening and injections	7 oz. purulent ... ... 20 oz. pus	Probably 2 cysts ... ... Seen some months after	Cure ...	Bird, T. & G., Feb. 3, 1877
3	M.	17	Pot. iod. hypodermic syringe Free opening and injections	Pus ... ... 50 oz. pus and hydatids	Right lobe of liver almost destroyed	Death ...	Sieveking, Lancet, May 8, 1869

4	M.	24	Exploratory puncture ... Fine trocar ... ... Free opening, followed by hæmorrhage	7 oz. containing pus and hooks Few drops thick ... 80 oz. pus	More than 1 cyst ... ... Passed hydatids per rectum	Death ...	Murchison, p. 109
5	M.	25	Fine trocar, wound closed	8 oz. turbid, chlor, alb. hooks	Pain and sickness after operation	Cure ...	Murchison, p. 95
6	M.	29	Exploratory needle and K.H.O.	Small quantity of pus ...	Peritonitis after operation ... Opened into kidney prior to operation Discharged at own request	Doing well	Barclay, B. M. J., Nov. 7, 1868
7	M.	29	Aspirator, numerous punctures Wound enlarged and left open, injection	Small quantity opalescent 22 oz. decomposing, cysts	Urticaria, discharge from wound contained bile Opened into lung	Death ...	Bradbury, B. M. J., Oct. 24, 1874
8	M.	35	Aspirator ... ... Incision and drainage-tube	Thick and offensive ... 60 oz. pus	... ...	Cure ...	Ramskill, B. M. J., Nov. 14, 1874
9	M.	35	Exploratory puncture ...	No result; trocar too short	Pyæmia	Death ...	Murchison, p. 119
10	M.	42	Puncture ... ... Aspirator, large needle...	6 oz. purulent 170 oz. pus and hooks ...	Seen 7 months after	Cure ..	Bradbury, B. M. J., Sept. 1, 1877
11	M.	47	3 cysts, grooved needle... Free openings	Pus ... ... Pus and hooks	... ...	Cure ...	Fuller, B. M. J., Oct. 18, 1873
12	M.	61	Fine trocar	72 oz. purulent	... ...	Cure ...	Duffin, Clin. Soc. Trans., v. 6
13	F.	13	Exploratory needle ... Medium trocar and drainage-tube	Glairy ... ... 2 oz. pus...	Had been previously tapped... Expectorated pus and hydatids	Cure ...	Greenhow, Path. Soc. Trans., v. 18
14	F.	24	Puncture wound closed 2 days after Incision and drainage-tube	1 oz. pus ... ... 8 oz. pus and hydatids	... ...	Cure ...	Murchison, p. 118
15	F.	25	Thompson's trocar ... Aspirator ... ... Aspirator	10 oz. turbid ... ... No result ... ... 4 oz.	Jaundice ... ... Discharged at own request	.. ...	Duckworth, B. M. J., Aug. 12, 1871

TABLE III.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
16	F.	27	Aspirator	Pus and hooks	Sickness and hiccough after operation	Death ...	Silver, T. & G., Jan. 11, 1879
			1 month after, aspirator and incision	40 oz. thick pus... ...	Continued discharge of bile		
			Injections				
17	F.	28	Aspirator	Pus	Multiple hydatids	Death ...	Hayden, B. M. J., Aug. 25, 1877
					A few days after operation		
18	F.	29	Quoted in paper... ...	... ...	... ...	Cure ...	Liveing & Balding, Paper case II.
19	F.	30	Fine trocar, immediately	6 oz. bile and offensive...	Bile-duct enlarged and blocked by cyst	Death ...	Murchison, Path. Soc. Trans., 19
			Large trocar, injection, wound open	8 oz. hydatids and fluid			
20	F.	39	Fine trocar, followed by large trocar	7 oz. viscid pus	Expectorated hydatids ...	Cure ...	Murchison, p. 108
			Canula left in, cavity washed out	Pus			
21	F.	32	Aspirator	Pus	No evidence of tumour when last seen	Cure ...	Paget, B. M. J., Oct. 31, 1874
			Size of trocar increased...	9 oz. purulent			
22	F.	—	2 cysts, aspirator ...	Pus	Tapped 8 years previously ...	Cure ...	Ransom, B. M. J., Sept. 17, 1873
			Fistulous opening formed				
23	M.	45	Quoted in paper... ...	... ...	... ...	Death ...	Balding, Paper case I.
24	M.	35	Quoted in paper... ...	... ...	... ...	Cure ...	Balding, Paper case III.
25	M.	32	Trocar into chest ...	40 oz. yellow grumous ...	Admitted as a case of typhoid	Death ...	Cayley, Path. Soc. Trans., v. 27
			Counter open and drainage-tube	Hydatids and fluid ...	Expectorated hydatids Suffocated by cyst		
26	M.	40	Twice tapped	Chocolate-coloured fluid	Opened into urinary passages	... ...	Maclaran, B. M. J., Feb. 26, 1876
27	F.	15	Large trocar to give temporary relief	248 oz. dirty-brown fluid	Only operated upon with view to temporary relief, tubercle. Died 23rd day	Death ...	Greenhow, Murchison, p. 122

28	F.	36	Fine trocar	37 oz. turbid	2 cysts, burst 11 months after into bowel	Cure ...	Ward, Lancet, April 2, 1870
29	F.	39	Aspirator	1 oz. gelatinous	Cyst communicated with pleura. Peritonitis and pneumonia	Death ...	Andrew, Lancet, Dec. 4, 1875
			Large trocar and free open	Very thick and hydatids			
30	—	—	Fine trocar; suppuration; free opening	10 oz. milky	... ...	Cure ...	McGillivray, Aust. Med. Jour., Mar., 1867
31	—	—	Medium trocar	31 pints opaque and pus	2 cysts; shock after operation, 5 days after operation	Death ...	Fuller, Clin. Soc. Trans., vol. 6
32	F.	18	Ordinary trocar; wound closed	30 oz. greenish watery ...	Portion of tumour remained 6 months after	Cure ...	Harley, No. 30
33	F.	22	Ordinary trocar; wound open for time	Glutinous	... ...	Cure ...	Harley, No. 52
34	F.	27	Caustics; ordinary trocar; free opening and injections	100 oz. pus	Caustics failed to produce adhesions	Death ...	Harley, No. 73
35	F.	—	Common trocar; wound closed	Many pints pus	Due to abortion	Death ...	Harley, No. 13
36	F.	—	Common trocar; wound closed	Many pints hydatids and thick	... ...	Death ...	Harley, No. 10
37	M.	33	Common trocar	2 drachms pus	... ...	Death ...	Harley, No. 68
			Incision and injections ...	40 oz. pus			
38	M.	36	Caustics; ordinary trocar; free opening and injec.	35 oz. pus	... ...	Cure ...	Harley, No. 71
39	M.	42	Trocar	Pus	... ...	Death ...	Harley, No. 54
			10 days after, incision and free opening	30 oz. purulent			
40	M.	56	Medium trocar; wound closed	100 oz. thick	Only under observation 14 days	... ...	Harley, No. 2
41	M.	58	Small trocar	30 oz. turbid	10 days after operation ...	Death ...	Harley, No. 44
			6 days after	30 oz.			
42	M.	59	Small trocar	1 oz. turbid	Slight constitutional disturbance	Cure ...	Harley, No. 53
			7 days after, large trocar and drainage-tube	Small quantity			
43	M.	29	Small trocar; permanent opening	390 oz. purulent at last ...	Fluid at last contained considerable bile and pus	Cure ...	Harley, No. 75

TABLE III.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
44	M.	—	Incision; large trocar; wound closed Afterwards free opening...	120 oz. purulent... ...	Feverish as soon as opening closed	Cure ...	Harley, No. 59
45	F.	16	Caustics; exp. trocar; free and permanent opening	Many pints Contained bile	... ...	Cure ...	Harley, No. 70
46	Boy	—	Common trocar; wound closed	240 oz. greenish... ...	Had ascites, general dropsy and orthopnœa prior to operation	Death ...	Harley, No. 11
47	F.	52	Paracentesis	31 pints bile stained, and hydatid cysts	... ...	Death ...	Fuller, Path. Soc. Trans., vol. 20
48	F.	60	Aspirator; wound closed	6 oz. opalescent	No tumour 2 years after ...	Cure ...	Murchison, p. 94
49	F.	20	Puncture; suppuration; free opening	10 oz. blood, pus, and hydatids	... ...	Cure ...	Harley, No. 61

TABLE IV.

Cases in which the character of the fluid at the first puncture is not stated at the reference given.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	F.	9	Small trocar, wound closed 6 months after, cyst in lung	... ...	... ...	Cure ...	Bird, T. & G., Aug. 9, 1873
2	F.	13	2 cysts, fine trocar ...	... ...	... ...	Doing well	McGillivray, Aust. M. Jour., July, 1872
3	F.	23	Fine tro., more than 1 punc.	120 oz. and 114 oz. ...	... ...	Cure ...	Murchison, p. 77

4	F.	28	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. Med. J., July, 1872
5	F.	30	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. Med. J., July, 1872
6	F.	32	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. Med. J., July, 1872
7	F.	33	2 cysts, fine trocar ...	50 oz.	Interval of 6 weeks bet. oper.	Cure ...	Sibson, Lancet, July 18, 1868
8	F.	42	Fine trocar	40 oz.	2 drs. of alcohol injected ...	Cure ...	Murchison, p. 77
9	F.	46	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. Med. J., July, 1872
10	—	—	Fine trocar	... ...	... ...	Cure ...	Murchison, Tab. I., No. 49
11	—	—	Fine trocar	... ...	... ...	Cure ...	Murchison, Tab. I., No. 50
12	—	Aged.	Had been previously tapped. Declined operation	... ...	Tum. disappeared in 6 weeks	Cure ...	Bird, T. & G., Aug. 9, 1873
13	—	Ch.	Hypodermic syringe, fluid allowed to drain off	... ...	... ...	Cure ...	Sibson, Lancet, July 18, 1868
14	M.	3	Fine trocar, tapped twice	... ...	... ...	Cure ...	McGillivray, Aust. Med. J., July, 1872
15	M.	8	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
16	M.	13	Fine trocar, suppuration, free opening	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
17	M.	28	Pot. iod., fine trocar and syringe, wound closed 8 months after, fine trocar, wound closed	5 oz. ... ... 20 oz., hooks and chlor., no pot. iod.	Pain in back and urticaria ...	Cure ...	Murchison, p. 87
18	M.	27	... ...	5 or 6 defunct hydatids...	Left Hospital in a week ...	... ...	[7, 1868 Page, B. M. J., Nov.
19	M.	27	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. M. J., Aug., 1865
20	M.	32	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
21	M.	49	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872

TABLE IV.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
22	M.	49	Fine trocar; tapped 3 times, suppuration	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
23	M.	51	Fine trocar, tapped twice	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
24	M.	56	Fine trocar	30 oz. and 20 oz. ...	Second puncture 2 weeks after first	Cure ...	McGillivray, Aust. M. J., Aug., 1865
25	M.	59	Fine trocar	... ...	... ...	Cure ...	McGillivray, Aust. M. J., July, 1872
26	M.	61	Fine trocar; suppuration free, and per. open	... ...	... ...	Cure ...	McGillivray, Aust: M. J., July, 1872
27	M.	31	More than one puncture	160 oz. each puncture ...	Due to rupture into lung ...	Death ...	Harley, No. 35
28	F.	26	Caustics, fine trocar ... Incision free, open, and injection	16 oz. ... ... 25 oz.	Fever after second puncture...	Cure ...	Harley, No. 76
29	F.	30	Small trocar, wound closed	30 oz.	No evidence of return 8 months after	Cure ...	Harley, No. 3
30	F.	40	Explor. trocar, wound closed; inject. of alcohol	40 oz.	No trace of tumour 3 months after	Cure ...	Harley, No. 31
31	F.	—	Free opening at first ...	... ...	Died quickly	Death ...	Harley, No. 65
32	—	—	Exp. trocar wound closed; more than 1 punct.	2 oz.	... ...	Cure ...	Harley, No. 40
33	—	—	More than 1 puncture, wounds closed	2 oz.	Cyst continued to grow ...	... ...	Harley, No. 42
34	—	—	Explor. trocar, more than 1 punct., wounds closed	2 oz.	Cyst continued to grow ...	... ...	Harley, No. 43
35	—	—	Wound closed	... ...	... ...	Cure ...	Harley, No. 23
36	—	—	Wound closed	... ...	... ...	Cure ...	Harley, No. 24
37	—	—	Exp. trocar, more than 1 punct., wounds closed	2 oz.	... ...	Cure ...	Harley, No. 41
38	—	—	Exp. trocar, more than 1 punct., wounds closed	2 oz.	... ...	Cure ...	Harley, No. 39

TABLE V.

Cases treated by caustics, incisions, or caustics and incisions, an opening of considerable size having been maintained from the first.

	Sex.	Age.	Treatment.	Amount and character of fluid.	Remarks.	Result.	Reference.
1	F.	29	Incision to peritoneum ... 3rd day into cyst	20 oz. clear	Abdominal pain	Cure ...	Harley, No. 88
2	F.	31	Large trocar, free opening	16 pints pus	Fistula for 12 months ...	Cure ...	Harley, No. 58
3	F.	40	Vienna paste, 7 applications	5 pints pus	... ...	Cure ...	Harley, No. 91
4	M.	25	Vienna paste and rupture	105 oz. clear	... ...	Death ...	Harley, No. 63
5	F.	47	Incisions, 2 stages, injections	Sero-purulent	... ...	Death ...	Harley, No. 86
6	F.	62	Puncture and permanent opening	80 oz. offensive	Only under observation 4 days	... ...	Harley, No. 62
7	F.	—	Incisions through thorax and diaphragm in stages	... ...	... ...	Cure ...	Herr Mart, B. M. J., May 10, 1879
8	—	—	Incisions	.. ..	... ...	Cure ...	Harley, No. 90A
9	—	—	Incision through thorax and diaphragm	... ...	Previously punctured... ...	Cure ...	Herr Gemmer, B.M.J., May 10, 1879
10	—	—	Incision under spray ... Cyst stitched to abdominal wall	... ...	Cyst evacuated under spray...	Cure ...	Sanger, T. and G., April 7, 1877
11	M.	10	Large trocars, permanent opening	... ...	... ...	Cure ...	Harley, No. 57
12	M.	12	Incision and permanent opening, suppuration	8 oz. clear	... ...	Cure ...	Harley, No. 55
13	M.	15	Caustics, punct. and permanent opening	10 oz. limpid	Vomiting and slight erysipelas	Cure ...	Harley, No. 50
14	M	18	Explor. punct. and incisson, permanent open.	Serous	Under observation for 2 months	Cure ...	Harley, No. 90

TABLE V.—*continued.*

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
15	M.	20	Caustics two applications per. open. and injections	10 pints	No bad symptoms	Cure ...	Harley, No. 92
16	M.	24	Explor. punct. and caustics	9 pints	Hæmorrhage into cyst ...	Death ...	Harley, No. 94
17	M.	28	Incision	Limpid	Expectorated hydatids ...	Cure ...	Harley, No. 78
18	M.	29	Trocar and per. opening and injections	19 pints clear	... ...	Cure ...	Harley, No. 75
19	M.	33	Caustics, incision, and per. opening and inject.	20 oz. limpid	Watched for 11 months ...	Cure ...	Harley, No. 89
20	M.	35	Incision and per. opening	Sero-purulent	... ...	Death ...	Harley, No. 87
21	M.	36	Incision and per. opening	12 pints	... ...	Cure ...	Harley, No. 80
22	M.	37	Incision and canula ...	9 pints bloody serum ...	... ...	Death ...	Harley, No. 79
23	M.	38	Caustics and incision, permanent opening	10 oz. turbid	Unsatisfactory till free opening	Cure ...	Harley, No. 64
24	M.	38	Puncture and poultice ...	160 oz. purulent... ...	Tenderness over tumour ...	Death ...	Harley, No. 60
25	M.	56	Grooved needle, caustics, and inc., per. opening	Viscid	... ...	Cure ...	Harley, No. 56
26	M.	62	Incision	Pus	Only lived 3 days	Death ...	Harley, No. 85
27	M.	—	Incision	Hydatids...	Lived 5 days	Death ...	Harley, No. 83
28	M.	—	Incision	40 oz. limpid	Hiccough and vomiting; lived 3 days	Death ...	Harley, No. 84
29	M.	—	Incision	Vesicles	Lived 1 year	Death ...	Harley, No. 82
30	M.	—	Incision	Vesicles	... ...	Cure ...	Harley, No. 81

TABLE VI.

Cases treated by Electrolysis or Acupuncture without previous Exploration.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	F.	7	Electrolysis for 20 minutes	Slight pain after operation	No tumour to be felt when last seen	... ...	Fagge, Med. Chi. Soc. Trans., v. 54
2	M.	17	Electrolysis 25 minutes...	Slight pain after operation	No tumour to be felt when last seen	... ...	Fagge, Med. Chi. Soc. Trans., v. 54
3	M.	13	2 tumours; electrolysis, 1868 Afterwards punctured, 1871	Fluid in right chest Sickness from chloroform; urticaria	Slight trace of tumour two years after	... ...	Phillips, Med. Chi. Soc. Trans., v. 54
4	M.	4	2 cysts; electrolysis 10 minutes	Slight fluctuation in abdomen	Tumour decreased 21 months after	... ...	Rees, Med. Chi. Soc. Trans., v. 54
5	F.	7	Multiple cysts; electrolysis, 12 minutes one cyst; 12 day electrolysis other cyst	Vomiting from chloroform; fluctuation in abdomen after both punct.	Obscure fulness when last seen	... ...	Fagge, Med. Chi. Soc. Trans., v. 54
6	F.	9	Electrolysis for 10 minutes	Scarlatinoid rash; fluid in abdomen	Tumour disappeared 8 months after	... ...	Fagge, Med. Chi. Soc. Trans., v. 54
7	M.	5	Electrolysis 20 minutes...	No fluctuation of abdomen	Still trace of tumour 17 months after	... ...	Fagge, Med. Chi. Soc. Trans., v. 54
8	F.	27	Electrolysis 16 minutes...	Slight pyrexia; no fluctuation of abdomen	Tumour decreased 9 months after	... ...	Wilks, Med. Chi. Soc. Trans., v. 54
9	F.	9	Simple acupuncture 5 minutes	No fluctuation of abdomen	Tumour decreased when last seen	... ...	Playfair, Med. Chi. Soc. Trans., v. 54

TABLE VII.

Cases treated by Drugs only; not operated upon, not diagonised during life, or allowed to rupture spontaneously.

	Sex.	Age.	Treatment.	Amount and Character of Fluid.	Remarks.	Result.	Reference.
1	—	Boy	No operation; admitted for ascites	Paracentesis	Cyst not punctured	Cure ...	Green, B. M. J., Oct. 6, 1877
2	M.	30	No operation; ruptured into peritoneum	Paracentesis	Expectorated hydatids ...	Cure ...	Potain, Lancet, Jan. 25, 1879
3	M.	56	No treatment given ...	... ...	... ...	Cure ...	Murchison, p. 130
4	—	—	No treatment given ...	... ...	... ...	... ...	Jenner, B. M. J., Oct. 28, 1876
5	M.	40	Rupture	... ...	No wound 6 years after ...	Cure ...	Harley, No. 98
6	F.	20	Rupture	Clear	... ...	Cure ...	Harley, No. 93
7	F.	42	Rupture	Gelatinous	Fistula many years	Death ...	Harley, No. 96
8	F.	50	Rupture	Pus	... ...	Death ...	Harley, No. 95
9	F.	53	Rupture 29 years before death	Purulent	Calcareus degeneration ...	... ...	Harley, No. 99
10	F.	—	Rupture	12 pints...	... ...	Death ...	Harley, No. 97
11	—	—	Rupture	... ...	Sloughing of abdominal wall.	Death ...	Harley, 100
12	M.	16	No operation	... ...	Numerous cysts in liver and attached to other organs	Death ...	Logan, Path. Soc. Trans., v. 16
13	M.	19	No operation	... ...	Burst into lung; secondary abcesses in liver	Death ...	Pollock, Path. Soc. Trans., v. 16
14	M.	27	No operation; admitted in a state of coma	.. ..	Cyst suppurating on admission	Death ...	Murchison, p. 120
15	M.	33	No operation	. ...	Hydatids passed per rectum; lived 1 year	Death ...	Murchison, p. 129
16	M.	35	Refused all treatment ...	.. ..	... ...	... ...	Smith, T. & G., Oct. 12, 1872
17	M.	35	No operation	... ...	Several cysts in liver and other organs	Death ...	Legge, Path. Soc. Trans., v. 25

18	M.	36	Two tumours communicating with pleura and stomach; no operation	... ...	... ...	Death ...	Russell, T. & G., April 26, 1873
19	M.	36	No operation	... ...	Hydatids passed per rectum...	Cure ...	Whateley, Path. Soc. Trans., v. 26
20	M.	36	Not diagnosed during life	... ...	Due to small pox	Death ...	Murchison, Path. Soc. Trans. v. 18
21	M.	49	Supposed to be ascites ...	15 pints...	Cirrhosis and cancer	Death ...	Silver, Path. Soc. Trans., v. 25
22	M.	53	Leeches; no operation ...	... ...	Hydatids passed per rectum...	Death ...	Murchison, Path. Soc. Trans., v. 16
23	M.	54	No operation	... ...	Burst into pleura	Death ...	Murchison, p. 124
24	M.	72	No operation	... ...	In liver (?)	Death ...	Murchison, p. 125
25	M.	—	Not diagnosed during life	... ...	... ...	... ...	Legg, B. M. J., Feb. 7, 1874
26	M.	—	Not diagnosed during life	... ...	... ...	... ...	Hamilton, B. M. J., Dec. 14, 1872
27	F.	14	Potass. iod.	... ...	Seen 1 year after	Cure ...	Fox, B. M. J., May 13, 1871
28	F.	17	Not diagnosed during life	... ...	Burst into pleura	Death ...	Murchison, p. 123
29	F.	21	No operation	... ...	Pus in urine; not in Hospital	Death ...	Murchison, p. 125
30	F.	27	Opiates; no operation ...	... ...	Admitted with peritonitis ...	Death ...	Johnson, T. & G., Jan. 1, 1876
31	F.	33	No operation	... ...	... ...	Death ...	Murchison, p. 114
32	F.	40	No operation	... ...	Hydatids of other organs ...	Death ...	Murchison, p. 129
33	F.	45	No operation	... ...	Hydatids of liver and omentum	Death ...	Murchison, p. 128
34	F.	45	No operation	... ...	Hydatids of other organs ...	Death ...	Murchison, p. 127
35	F.	60	No operation	... ...	Hydatids passed per rectum...	Death ...	Holden, B. M. J., July 10, 1869

REMARKS

ON PNEUMATIC ASPIRATION

ERRATA.

For "rather interesting," *read* "other interesting," p. 10, line 3 from the top.
For "complained over," *read* "complained of over," p. 12, line 1.
For "glariy," *read* "glairy," p. 23, line 12 from the top.
For "deodenum," *read* "duodenum," p. 23, line 7 from the bottom.
For "proxysmal," *read* "paroxysmal," p. 25, line 6 from bottom.
For "these angles," *read* "their angles," p. 26, line 14 from the top.
For "temperature 97°41'F.," *read* "temperature 97°4'F.," p. 38, line 11 from the top.
For "was a hopeless," *read* "was almost a hopeless," p. 46, line 15 from the top.
For "calvicular," *read* "clavicular," p. 47, line 10 from the top.
For "yards," *read* "feet," p. 65, line 13 from the top.

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1873.

REMARKS

ON

PNEUMATIC ASPIRATION

WITH

CASES OF ABSCESS OF THE LIVER TREATED BY THIS METHOD.

BY

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THE employment of pneumatic aspiration as a therapeutic agent has only, during the last three or four years, received that attention from the Profession which it seems to deserve. It is true that "*cupping*," which is an instance of pneumatic aspiration, has been known since the time of Hippocrates, but, with this exception, very few, if any, instruments on this principle have been used in medical practice. About four years ago, Dr. Dieulafoy, of Paris, invented his "Pneumatic Aspirator," an instrument on the principle of the air-pump, indeed, as the inventor himself terms it, "a veritable air-pump in miniature." In the *British Medical Journal* for November 26th, 1870 (p. 579), will be found an account by Dr. Prothero Smith, of London, of an

"aspirator," invented by himself in the year 1867, and which, after having undergone various modifications, appears closely to resemble Dieulafoy's instrument. Dr. Smith has employed it successfully in cases of ovarian dropsy, ascites, &c.

Dieulafoy's "Pneumatic Aspirator"—reduced to half size—is depicted in the accompanying engraving, by a reference to which the following description will, I trust, be intelligible.* It consists of a glass cylinder surmounted with brass fittings (5), with a moveable brass-piston (*aa*), in which, near the piston-cap, is a notch (*b*). Then there are two "taps" (*c* and *d*), which, when placed parallel to their respective nozzles, open its channel, but when at right angles to the same, shut the passage completely. Fig. 1 is an "exploring needle,"—the largest-sized one; two others are also used, smaller and finer in calibre. They are all made of steel, *gilt*. Figs. 2 and 3 represent the large size (or No. 1 of Dieulafoy) trochar and cannula, two others, more delicate, being termed respectively Nos. 2 and 3. Fig. 4 is a small piece of guttapercha tubing, adapted to fit by one end to the front nozzle of the "aspirator," and, by the other, to the large end of either an exploring needle or cannula, as seen in the woodcut. Lastly, Fig. 6 is another piece of guttapercha tubing which is fixed by one end to the *lateral* nozzle of the "aspirator," and serves as a waste-pipe to carry away the contents of the cylinder when filled.

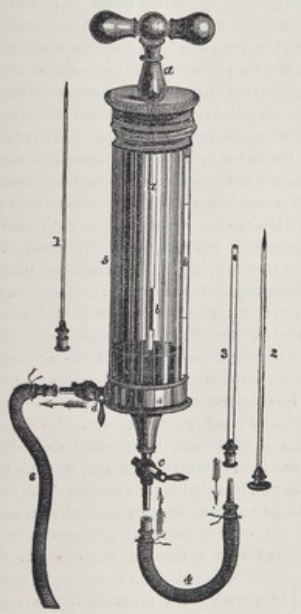
This instrument is capable of containing about two ounces of fluid.†

It may be employed both as a means of diagnosis and of treatment.

Supposing the presence of an abscess (or any collection of fluid) in a part, deeply situated, is required to be ascertained, the "aspirator" must first be prepared,—*i.e.*, a vacuum must

* It has been thought advisable to introduce this woodcut, as probably not many medical officers in this country have had an opportunity of seeing the instrument.

† Messrs. Weiss and Co., of London, are the sole manufacturers of this instrument.



DIEULAFOY'S PNEUMATIC ASPIRATOR REDUCED TO HALF SIZE.

1. Exploring needle.
2. Trochar.
3. Cannula.
4. Short guttapercha tube.
5. Cylinder.
   a a piston, with notch at *b*.
   c d stop-cocks or "taps."
6. Waste-tube.

be created; this is done by closing both the "taps" *c* and *d*; and then slowly drawing up the piston to its full extent, and fixing it by a slight rotatory movement from *left* to *right*. By this movement the notch *b* is locked upon a catch at the base of the cylinder, and the piston cannot be forced down by atmospheric pressure. One of the exploring needles is then oiled and passed into the suspected spot by a combined rotatory and onward movement between the finger and thumb of the operator.*

When the needle has penetrated for about half an inch or so, the anterior nozzle of the aspirator is applied to its free extremity; both are then pushed onwards, and when a sufficient depth has been reached, the tap *c* is opened. If now, there is pus or any other fluid present, it will rush into the vacuum in the cylinder, and become at once apparent; if there is none, the cylinder of course remains empty. The diagnosis in either case is complete.

More than one puncture, however, may be made if thought necessary, the extreme fineness and non-irritable character of the needles rendering them quite safe in this respect, and especially in the exploration of dense and tolerant organs, as *e.g.*, the liver. I have never seen any harm from three or four repeated punctures into hepatic substance.

Should fluid be discovered, the exploring needle is withdrawn, and the trochar and cannula (Figs. 2 and 3) used in the same way. On the withdrawal of the trochar, the fluid which streams from the cannula excludes the entrance of air, yet no time should be lost, but one end of the short guttapercha tube (Fig. 4) quickly attached to the cannula, the other to the anterior extremity or terminal nozzle of the aspirator, in which of course a vacuum has already been prepared in the manner above described. The tap *c* is turned, the fluid rushes into the cylinder, and when the latter is full, this tap is closed, the tap *d*

* This movement, rather than forcible thrusting of the needle, is advised, on account of its extremely delicate calibre, bending or even breakage being apt to occur if direct pressure is employed.

opened, and the piston being detached from its fixture is pushed downwards; the fluid then escapes through the lateral nozzle, and is conveyed away into any receiver by the tubing 6. The arrows in the engraving indicate the course taken by the fluid in the operation.

Thus, then, the whole operation is extremely simple, and the manipulation of the instrument easily acquired.

Care, however, is necessary on one or two points. Before commencing any operation it should be ascertained that the exploring needle is *pervious*: it is perhaps safest to keep a fine silver wire always drawn through these needles. The aspirator also should always be tested before actual use, to see that the vacuum is perfect. Well greasing the piston-cap with some thick oil, and the "aspiration" of warm water once or twice through the instrument, have been found useful for this purpose in practice.

Before proceeding further, it may be remarked that an instrument of this kind is certainly calculated to supply a great want in medical therapeutics. All ordinary methods frequently fail us when we wish to ascertain the presence of fluid—*e.g.*, pus—in such organs as the liver and kidney; in tumours occupying the pelvis, or deeply-imbedded in intermuscular and interfascial spaces. Under such circumstances we have been accustomed to use fine "exploring trochars," but apart from the coarseness and roughness of their manufacture at best, one very obvious defect is this, that they are always liable to become clogged by viscid or thick fluids; in the aspirator, however, we possess a suction-force which is very powerful, and capable of overcoming all such contingencies. Again, nothing perhaps approaches more to the truth of an axiom in surgical and medical practice of the present day than this,—that purulent collections wherever formed should be evacuated as soon as discovered, and yet, what hesitation and doubt are constantly experienced in the determination of this point, and often,

when to delay, is to incur serious danger? The aspirator here supplies us with a ready means by which to clear up these difficulties, and in parts inaccessible to, or incompatible with, ordinary operative interference, may be used with safety. Further, as Dieulafoy has shown, the instrument may also be employed for injecting medicated solutions when an astringent or antiseptic effect is required to be produced on the walls of an emptied cavity.

The applicability of the instrument is, therefore, very varied and extensive.

By this method of subcutaneous pneumatic aspiration, Dieulafoy has successfully treated cases of hydatid cysts of the liver, effusions into the joints, pleurisies and empyemas, hydrops pericardii, hydrocephalus, and deep seated abscesses in various parts of the body.*

On the introduction of this instrument into England in the early part of 1870, Professor Maclean of Netley conceived the idea of employing it in the treatment of hepatic abscess,—a disease in which it had not been previously made use of, yet so common among soldiers invalided from the tropics. He was soon able to test the value of the "aspirator" in two cases of this nature then present in the wards of the Royal Victoria Hospital, and I had the opportunity of witnessing the results obtained. They were in each case so favorable, that I determined to give this method a more extended trial on my arrival in India. The opportunities for so doing have only lately been available, and I am greatly indebted to Dr. D. B. Smith and Dr. Chuckerbutty for allowing me to carry out this method of treatment in the following thirteen cases, which have all occurred in their wards in the Medical College Hospital. I have also to thank Sub-Assistant Surgeons Ram Kali Gupta and Deno Nath Mitter, the clinical assistants to the above gentlemen, for the use of their

* See cases published in the *Gazette des Hôpitaux*, March 26th and 31st, and April 28th, 1870.

notes in the compilation of these cases. For the fourteenth case my obligations are due to Dr. Waller of Calcutta;—the subject was a private patient of this gentleman's, who has most kindly placed his "notes" at my disposal. My acknowledgments are also due to Dr. Lewis of the General Hospital, for many valuable suggestions and much kindly help during the progress of this paper.

Case No. I.—A Hindu, aged 40, was admitted on the 16th of May 1872.

The *history* he gave was as follows:—For the last year he has been suffering on and off from intermittent fever. Six months ago he first felt an uneasiness or slight pain in the region of the liver, this was followed by swelling or enlargement of the organ, which has gradually increased. He has lost flesh and strength considerably. Has never suffered from dysentery.

On admission he is seen to be extremely emaciated, and so weak that he has to be supported in walking; his countenance is pinched and worn-looking. Conjunctivæ clear.

A prominent tumour-like swelling occupies the whole of the right hypochondriac, epigastric, and part of the left hypochondriac regions.

This space, too, is absolutely dull on percussion, and the extent of dulness vertically is from the level of the right nipple to below that of the umbilicus. The right lower half of the chest-wall is bulging. The skin over this part is smooth, distended, and shiny, and traversed by tortuous varicose veins. Several cicatrices are observed in the right infra-mammary and infra-axillary spaces, the remains of scarifications performed by native *kubarajes*, about six months ago, for the relief of the hepatic pain. Fluctuation is felt indistinctly below the right false ribs, very plainly between the ninth and tenth and tenth and eleventh ribs laterally.

Respiration is entirely absent from the lower half of the right side of the thorax, whereas vocal fremitus and resonance are

here greatly increased. Above this part the breathing is coarse and accompanied by moist mucous râles. Percussion over the left half of the chest is normal, the breathing rather puerile.

The patient has a troublesome spasmodic cough, excited especially by any attempt to lie on the left side. The expectoration is pretty copious, frothy and muco-gelatinoid. The heart's area, impulse and sounds are normal. Pulse 90, small and weak.

Temperature 98° F. Suffers from fever almost every day. No rigors. Bowels constipated. No appetite. Occasional nausea and vomiting

2*nd day*.—This morning, at 9 o'clock, a fine exploring needle having been first introduced between the tenth and eleventh ribs, and the presence of pus in the liver identified, the largest (No. 1) trochar and cannula were used, and by means of the aspirator *one hundred and twelve ounces* of pus were evacuated with the greatest ease. The patient bore the operation well, being supported through it by small doses of weak brandy and water.

The pus was thick, and reddish brown in colour. A little antiseptic dressing was placed over the puncture, and a broad flannel bandage round the abdomen.

3-30 P.M.—Pulse 94, temperature 98°F. The patient expresses considerable relief after the operation.

6-30 P.M.—Pulse 94, temperature 100° F. Feels comfortable. Pain in the hepatic region much relieved. Cough less troublesome. Has taken a considerable quantity of food. Hepatic dulness has descended for two and a half inches below the right nipple.

3*rd day*.—Has passed four very copious feculent stools last night, amounting altogether to about six pints. Pulse 92, temperature 101°F.

Vespere.—Cough rather more troublesome. Loud mucous râles are heard all over the right half of the thorax. Expectoration more abundant, and consists of frothy, slightly yellowish mucus.

Bandage removed from the body. The puncture has entirely healed. Abdominal tumour has completely disappeared, and hepatic dulness does not extend above an inch, or an inch and a half, beyond its normal limits.

5*th day*.—Temperature 98°5′F., pulse 90, respiration 26. Free from fever. Cough less troublesome.

Vespere.—Temperature 101°5′F., pulse 94, respiration 28.

8*th day*.—No more fever. Very little cough: vesicular respiration is taking the place of the mucous râles in the chest. The hepatic dulness is almost confined to its normal limits.

9*th to* 19*th day*.—Has continued steadily to improve. The bronchitis has entirely subsided, and so also has all pain and tenderness in the liver. Has gained strength considerably, and is able now to walk about without assistance. The temperature has fluctuated between 98° and 99°F., the pulse between 84 and 90.

June 4*th* (20*th day*).—Discharged.

Remarks.—During the whole period of residence in hospital, the only medicine prescribed for this patient was a little quinine with nitro-hydrochloric acid, and a stimulant expectorant for the cough. He was placed on "milk diet" on admission, and had to be supported by large quantities of stimulants, but his appetite returned very soon after the operation: three or four hours after the "tapping" he was able to sit up and eat a hearty meal.

This was the first case in which Dieulafoy's aspirator was employed in this hospital, and the result was certainly most encouraging. The abscess was evidently an enormous one (112 ozs.). It is noteworthy also, that, on the night succeeding the operation, the patient passed by bowel about six pints of semi-solid fœcal matter,—*i.e.*, a quantity about equal in amount to the pus removed from the liver! Probably the lower edge of the enlarged liver had pressed upon the colon, and caused this accumulation to take place. The quick recovery of the patient

after the aspiration, notwithstanding the attack of bronchitis, and in spite of the almost hopeless nature of his case on admission, are rather interesting points connected with this highly instructive case.

Case No. II.—A Hindu student, aged 20, was admitted on the 13th July 1872.

The patient states that three months ago he suffered from an acute attack of intermittent fever, which lasted a fortnight; the paroxysms occurred daily during this period. About this time, also, he first experienced pain, with tenderness on pressure over the right hypochondrium. In the course of about a month, a visible swelling or enlargement manifested itself in the hepatic region. As the swelling increased, the pain became less. A blister was applied over the part by a native practitioner, and quinine administered internally.

He is still subject to occasional attacks of *ague*, they recur irregularly at intervals of four or five days, and last for two or three. His habits have always been temperate. He has never suffered from diarrhœa or dysentery.

On admission the patient is somewhat anæmic and thin. The eyes are slightly jaundiced. He is able to walk about, but feels weak, and is easily exhausted. A globular swelling is visible in the right hypochondro-epigastric region: the lower border of the liver is not well definable, but appears to lie from three to four inches below the right false ribs; there is not much lateral enlargement of the organ, and its superior limits are normal. The globular swelling fits into the palm of the hand when the latter is placed over it with the fingers semiflexed (this best describes the size of the tumour). The skin over this part is tense and stretched; the superficial veins well marked. At one point, a little to the right of the ensiform cartilage, and about an inch and a half below the false ribs, fluctuation is distinct. The abdominal wall at this part cannot be pinched up between the fingers, but gives the impression of being bound down.

There is tenderness on pressure over the whole of the hepatic tumour, and dragging pain experienced when any attempt is made to lie on the left side.

The other abdominal organs and the lungs and heart are all healthy.

The bowels are regular, but the stools are "hard" and scanty. Urine high-colored. Pulse 84, temperature 98°F. Appetite fair.

Placed on "milk diet;" and quinine and nitro-hydrochloric acid prescribed.

5th day.—Pulse 84, temperature 98°6′F. The outline of the enlarged liver can be clearly defined to-day. Pain and tenderness have increased over this part.

At 9-30 A.M. the abscess was first explored and then *tapped*, with Dieulafoy's aspirator, through the abdominal wall, at the spot where fluctuation appeared most distinct (above indicated). *Thirty-three ounces* of thick, reddish-grey, laudable pus were evacuated. The *aspirator* did not work well, so that it required about an hour to remove the matter.

11-30 A.M.—Pulse 84, temperature 97°F., perspiring.

Vespere.—Pulse 108, excited; temperature 100°F. Took his food well. Feels great relief.

6th day (*i.e.*, *first after operation*).—Pain complained of at the site of the puncture; otherwise well. Has slept fairly, and looks cheerful. Pulse 96, temperature 98°2′F.

Vespere.—Has taken nourishment well. Pulse 92, temperature 98°2′F.

7th day.—Pain in the hypochondrium less. The hepatic swelling has entirely subsided, and the lower margin of the liver lies about two fingers' breadth below the costal arch. Pulse 78, temperature 98°8′F.

10th day.—It is thought a little indistinct, deep-seated fluctuation can be distinguished to-day just below the site of the puncture into the liver, the lower border of which has descended a little. Pulse 78, temperature 98°4′F.

Vespere.—Slight pain complained over the hepatic region. Pulse 84, temperature 98°F.

12*th day.*—The enlargement of the liver has apparently subsided spontaneously, and no fluctuation can now be ascertained. Condition of patient improves daily.

20*th day.*—The hepatic tumour has somewhat suddenly become prominent, and distinct fluctuation is observed at the spot before alluded to. This has not been preceded by any rigor or rise in temperature, and the patient remains well as regards his general health. Pulse 78, temperature 98°6′F.

22*nd day.*—Fluctuation more distinct; the lower boundary of the liver extends to within half an inch of the umbilicus. The aspirator was again used this morning, and the abscess *tapped* for the second time through the same (first) puncture. *Twenty-seven ounces* of sero-pus were evacuated. The fluid is chiefly thin, reddish, prune-juice like, only four or five ounces of thick hepatic pus being contained in it. It is absolutely without odour.

Vespere.—Pulse 104, temperature 99°5′F. Has taken food well.

23*rd day.*—Feels easier. Pain over the tumour much relieved: no tenderness on pressure. Pulse 98, temperature 99°F.

Vespere.—Pulse 98, temperature 98°5′F.

33*rd day.*—Has improved daily since the second *tapping*. Liver-swelling much reduced in size: no return of fluctuation. Patient has remained entirely free from fever.

August 16*th* (35*th day*).—This is the 13th day since the second aspiration was performed, and no return of the abscess has taken place. The patient is much stronger and more healthy-looking than when admitted. Pulse and temperature normal. Discharged.

Remarks.—This patient had slightly jaundiced conjunctivæ on admission, his bowels were constipated, and there was pain, tenderness and a fluctuating tumour in the region of the liver:

but, it is remarkable that the pulse and temperature from first to last kept at or about the normal standard. The only deviations were on the day of each operation,—towards the evening on these two occasions, both pulse and temperature rose slightly, but only to fall again to the normal point next morning. In other words, there was no *hectic* from first to last. This seems to be not unusual in small abscesses of the liver, or even in those of moderate size, as in the present case. *Sixty ounces* (in all) of pus and sero-pus were evacuated. The operation was prolonged on the first occasion owing to imperfection in the "fittings" of the aspirator, and the greatest care was required to prevent, if possible, the admission of air into the abscess cavity. The relief to the patient was immediate after each aspiration, and he was finally discharged from the hospital without a bad symptom.

Case No. III.—A Bengali beggar, aged 45, was admitted on the 27th of July 1872.

Up to within the last eleven months has enjoyed what he terms "good health."

Eleven months ago, had a severe attack of intermittent fever, which lasted six days, and for some time after, he suffered from "burning of the hands and feet" with "chilliness" at night. In the early part of December last—about eight months ago—was attacked with dysentery very severely, the disease remaining in an acute form for quite two months, and ever since he has been subject to irregularity and looseness of the bowels. In March last—four months ago—experienced somewhat suddenly (after exposure to weather) a pain in the right hypochondrium, accompanied by rigors, fever, and enlargement of the liver. The latter has gradually increased, and the part has become very tender on pressure. Occasional attacks of *ague* and chronic dysentery are also complications complained of.

Has never been addicted to spirit-drinking. Had syphilis when a young man.

Present state.—Is very emaciated and feeble. Countenance anxious and worn. There is a distinct prominence of the right hypochondriac and epigastric regions, smooth and indistinctly circumscribed. The skin here is tense, adherent, covered with large tortuous veins, and presents four scars, due to the application (last month) of the actual cautery. The liver is enlarged: its lower border can be identified lying as low down as the umbilicus, and feeling very like "the edge of a hot-water plate." Hepatic dulness extends upwards to within an inch of the right nipple. Fluctuation can be distinguished in the hepatic swelling one inch and a quarter below and to the right of the ensiform cartilage.

Has three or four stools on an average daily. At present they are loose, feculent, and contain no mucus. Appetite bad; tongue red and raw-looking; urine high-colored, quantity normal; conjunctivæ clear.

Pulse 108, small and compressible, but regular. Temperature 100°F.

In the evening the pulse fell to 96, but the temperature was the same, 100°F.

3rd day.—Pulse 88, temperature 98°. Tongue clean and moister.

Has very little sleep at night. Complains of more pain over the hypochondrium. The intercostal movements on the right side are greatly diminished.

On gentle percussion over the right front of the thorax, resonance extends to *two* inches below the right nipple, but on firm percussion only to *one* inch below this spot.

Vespere.—Pulse 110, temperature 100° F.

5th day.—At 9 A.M., abscess first explored and then *tapped* with Dieulafoy's aspirator.* The instrument worked smoothly, and *twenty ounces* of somewhat thin, reddish-grey hepatic pus

* The puncture was made through the abdominal wall at the spot, where fluctuation appeared most distinct,—above indicated.

were evacuated. The patient bore the operation well. The puncture was dressed antiseptically.

After the operation, the lower border of the liver ascended to within two inches of the costal cartilages, and percussion gave a clear note over the right front of the thorax to *two* inches below the nipple. Pulse 100, temperature 99°5′F.

Vespere.—Slight pain at the seat of puncture, but the weight and tension in the liver complained of entirely removed. Pulse 96, temperature 99°5′F. Unable to pass urine,—bladder relieved by catheter.

6th day.—Passed three loose stools with griping, but on washing no mucus can be detected; they are thin and feculent. Complains of pain generally over the abdomen, yet the abdominal walls are soft and yielding. Pulse 92, temperature 98°F.

Vespere.—Urine again retained, efforts to pass it being ineffectual. Cough very troublesome. Sonorous and mucous râles are heard almost throughout the whole right lung. Pulse 98, temperature 99°5′F., respiration 28.

7th day.—No sleep on account of the cough. Expectoration almost absent. Pulse stronger and fuller, 80. Temperature 99°5′F., respiration 32.

Vespere.—Pulse 100, temperature 100°F., respiration 20. Feels much easier. Urine passed freely. The puncture made in the operation has quite healed. The hepatic tumour has altogether subsided, and the liver feels hard and firm, although enlarged. There is still some tenderness on pressure over this part.

10th day.—It is thought that a little indistinct deep-seated fluctuation can be made out, just below the seat of the puncture. No. 3 exploring needle was passed in at this point, but as only a drop or two of serum exuded, no further interference was deemed advisable.

17th day.—Liver remains enlarged, but hard and firm, and with no trace of fluctuation. Expectoration and cough have

almost disappeared. Has passed six scanty mucoid stools in the last twenty-four hours. Pulse 100, temperature 99°5′F.

28*th day.*—Within the last two or three days the hepatic swelling has become gradually more painful and prominent, and fluctuation has reappeared.

Vespere.—Pulse 120, temperature 105°F.

29*th day.*—Abscess *tapped* with the "aspirator" through the same puncture for the second time. *Twenty ounces* of thin sero-pus evacuated. The tumour immediately subsides. Before operation, pulse 86, temperature 100°F.

Vespere.—Pulse 100, temperature 100°F., respiration hurried. Has not taken food well. Complains of pain all over the abdomen.

30*th day.*—Abdominal pain has disappeared, and the hepatic tenderness is much less. Feels decidedly better. Pulse small and weak. Temperature 100°F.

31*st day.*—Appetite improving. Pulse 120, temperature 100°F. Unable to pass urine,—relieved by catheter.

34*th day.*—Liver remains enlarged, but almost free from pain or tenderness. It feels hard and firm. No return of fluctuation. The stools for the last three days have been two in number (daily) and free from all mucus. Pulse 92, temperature normal.

September 3*rd* (39*th day*).—Is troubled with a slight cough and scanty expectoration. The hepatic enlargement has considerably decreased. No fluctuation has returned. The patient's general health has improved, but he is still weak and not able to exert himself much. Becoming tired, however, of hospital-life, he was, at his own request, discharged to-day.

Remarks.—This patient was admitted in a very feeble and poor state of health, and from first to last was a very unfavorable case for any kind of operative interference. Yet, in reviewing the case, it cannot be doubted that both tappings benefited him, and that his condition was much improved during his residence in hospital. It would have been more satisfactory to have kept him under observation for some little time longer, but being of a

peevish, discontented disposition, there was no keeping him any longer from going "home." I have no reason, however, for believing that the abscess reformed. During the ten days which succeeded the second operation, no trace of fluctuation could be detected, and the liver appeared to be consolidating.

The total amount of pus evacuated was *forty ounces.* On both occasions it was unusually thin or serous in character; that removed by the latter aspiration was entirely free from fœtor. The small puncture in the abdominal wall always healed perfectly in about thirty-six hours.

This is a case in which the hepatic abscess seems to have been associated with dysentery.

Retention of urine for a day or two after the liver has been *tapped*—illustrated in the above case—is a symptom which has been met with several times, and is worthy of record as an occasional contingency after this operation.

Case No. IV.—A Mahomedan cook, was admitted on the 31st July 1872.

History.—Suffered three months ago from severe fever and diarrhœa, the illness lasting twelve days. During this attack he first experienced pain in the liver, which was soon followed by a tender swelling in the right hypochondrium. This has ever since gradually increased.

Still suffers at irregular and short intervals from paroxysmal fever, but the diarrhœa has entirely subsided. Has been for some time a spirit-drinker. Never suffered from syphilis.

Present Condition.—Very thin and reduced in flesh and strength.

A small, oval, circumscribed swelling is observed on the right side over the hepatic region, extending from the seventh to the tenth ribs near their angles. The tumour measures two inches from side to side, and indistinct fluctuation can be felt in it. The liver itself is a good deal enlarged, the area of hepatic dulness

extending as high as an inch above the nipple, and as low as an inch and a half below the costal arch.

Pulse moderately full, 104. Temperature 99°4′F.

2*nd day.*—Pulse 120, temperature 99°8′F. The abscess was this morning first explored and then *tapped* with Dieulafoy's aspirator, the puncture being made between the ninth and tenth ribs about half an inch anterior to their angles.

Twenty-eight ounces of thick, reddish hepatic pus were evacuated.

Six hours after operation: pulse 124, temperature 102°8′F. Has taken food well, and feels much relieved.

3*rd day.*—Pulse 108, temperature 101°8′F. Slept fairly. Very little pain in the liver.

6*th day.*—More uneasiness to-day in the hepatic region, and slight fluctuation felt at the seat of the first puncture. Pulse 116, temperature 99°6′F. Abscess *tapped* again at the same spot, and *one ounce* of thick, rosy pus evacuated.

Vespere.—Pulse 116, temperature 100°6′F.

9*th day.*—The last operation has given no permanent relief. Fluctuation has again appeared in the liver, and the part feels very painful and tender on pressure. The patient's breathing is somewhat hurried. Pulse 132. Once more the aspirator was used, and a puncture having been made between the ninth and tenth ribs, near the former one, the large size cannula and trochar were introduced, and *twenty-two ounces* of thin sanious pus, having a slight fœtid odour, were removed. The abscess cavity was then washed out by means of the same instrument, with a weak solution of carbolic acid (1 to 60).

Vespere.—Pulse 140. Feels considerably relieved, and has taken food well.

12*th day.*—The puncture through the ribs has not healed perfectly, slight oozing being detected at this spot on the removal of the antiseptic dressing. Pain in the liver has also, during the last twenty-four hours, increased. Both lungs are filled with

moist mucous râles and coarse sonorous rhonchi. Pulse 140, respiration 44.

Vespere.—During the day about eight ounces of thin pus have escaped through the puncture. Pulse 152.

13*th day.*—Matter escapes freely now from the wound between the ribs. Pulse 116, temperature 100°2′F.

Vespere.—Troubled with constant hiccup. Pulse 140.

15*th day.*—Very weak and low. Pus continues to dribble from the wound, but in smaller quantities. Pulse 128, temperature 98°2′F.

16*th August* (17*th day*).—Pulse 132, very low and restless. Passing small, scanty stools involuntarily in the bed-clothes. The puncture between the ribs is now a foul ulcer, with sloughy gangrenous edges. The dribbling of pus in small quantities continues.

Vespere.—Pulse 100. Body cold and covered with clammy sweat.

Died at 7-30 P.M.

Post-mortem Examination, sixteen hours after death.—The abdomen being opened and the liver examined, it was found that the whole of the capsule of this organ was enormously thickened, especially at its upper and outer part over the right lobe. The liver was here firmly connected to the abdominal parieties and diaphragm. The perforation effected by the aspirator had penetrated an abscess cavity which appeared to have involved originally the whole of the right lobe of the liver, but which was now seen to be contracted to the size of a large orange. It still contained a small quantity of thick, foul, slightly sanious pus. The walls of the cavity were ragged or tattered in appearance, and covered with fragments of greenish-yellow slough. From the superior wall, a narrow sinus—capable of admitting a crow-quill—appeared to lead into a second small circumscribed abscess, the size of a horse-bean, situated at the upper margin of the liver, just beneath the diaphragm.

Another abscess, the size of half a walnut, was found a little more deeply situated, close to the above; and a fourth, about the size of a pigeon's egg, was laid open quite superficially, near the anterior and upper surface of the right lobe.

The small portions of hepatic parenchyma intervening between these several abscesses were pale, anæmic, soft, and fatty.

The left lobe of the liver was also soft and very fatty, but showed no evidence of acute disease. No portion of the organ exhibited any reaction with solution of iodine. The gall-bladder was collapsed and empty. The weight of the liver was 3lbs. 4¾ozs.

The mucous membrane of the *small intestine* was highly vascular at its lower part, small ecchymoses being diffusely distributed in the submucous tissue of the last thirty inches of the ileum. The mucous surface of the *large intestine* was also preternaturally vascular, and in the transverse and descending colon showed slight elevation of the solitary follicles; but no evidences of dysenteric lesions, recent or remote, could anywhere be discovered, although carefully looked for.

The other viscera presented nothing remarkable, except that the bases of both lungs, and especially of the *right*, were found coated with thick recent inflammatory material (lymph), and the lower lobes in each were dark and œdematous.

Remarks.—The feeble reparative power of this patient, and the occurrence of multiple abscesses in the liver, were circumstances most unfavorable to his recovery, yet there can be no doubt that the successive operations brought considerable temporary relief. On all three occasions the aspirator worked inefficiently, the "taps" having become loose, and the vacuum consequently imperfect. I believe the abscess cavity was never thoroughly emptied. After a fistulous communication had been established, of course the admission of air could not be guarded against.

As a general rule, too, I think the puncture of an hepatic

abscess *through the ribs*—unless directly pointing in this direction (as in the above case)—should be avoided. In the movements of these parts in respiration, the edges of the puncture are apt to become separated, and certainly do not heal so readily as when the operation is performed through the abdominal wall.

The pus evacuated by aspiration amounted to *forty-one ounces*, and probably not less than from ten to fifteen ounces escaped by leakage, making a total of about fifty-five or fifty-six ounces in all. The diurnal temperature of this case is appended, *vide* Chart No. 1, p. 71.

Case No. V.—A Hindu ship-broker, aged 30, was admitted on the 2nd of October 1872.

Up to within the last four years confesses to have led a dissolute life, and to have "drunk hard." Latterly, he has been more abstemious.

In June (*i.e.*, four months ago) had an attack of Dengue, which ran its usual course. During this seizure, he first experienced pain and uneasiness in the liver, which did not subside with the fever, but, on the contrary, have continued gradually to increase in severity; and during the last twenty days the patient has also suffered from quotidean ague, the paroxysms—being preceded by distinct rigors—come on every afternoon, and last all night. The temperature this morning, on admission, is 99°F. The tongue is coated but moist. The bowels are confined; for some time past the stools have been scanty and clay-colored. Has never suffered from dysentery.

Complains of pain in the right shoulder, which sometimes extends down the side as far as the right groin. Hepatic dulness extends from the right fifth intercostal space, to about two and a half inches below the ribs. Distinct fluctuation is observed between the ninth and tenth ribs, and also indistinctly at the anterior extremity of the twelfth rib. In the former situation there is considerable œdema of the skin, which "pits" on pressure.

During respiration the movements of the right thoracic wall are considerably impeded: vesicular murmur in the lower half of the right lung is very weak.

All the other organs of the body appear to be healthy.

In the evening the pulse is 116, temperature 102°F.

3rd day.—Pulse 96, temperature 99°2′F. At 11 A.M. the hepatic abscess was first explored and then *tapped* with the aspirator,—at the spot where it seemed to point most distinctly, *viz.*, between the ninth and tenth ribs near their angles,—and *seventy-three ounces* of thick reddish pus were evacuated.

3 P.M.—Pulse 104, temperature 100°2′F.

Vespere (6 P.M.)—Pulse 120, temperature 100°2′F. Hepatic pain and distension much relieved, and the area of liver dulness has considerably decreased. Is feeling comfortable, and has taken food well.

4th day.—Pulse 105, temperature 99°F. Very little pain in the liver. Tongue slightly coated and dry.

Vespere.—Pulse 128, temperature 102°F.

10th day.—Fluctuation has reappeared in the liver, and again points between the ribs. Complains of stabbing pain in this part. The side is distended: the superficial veins numerous and dilated: restless. Temperature 98°4′F., pulse 92.

At 10 A.M. the abscess was *again tapped* in the same ninth intercostal space, close to the former puncture. The aspirator worked badly, yet *forty-two ounces* of pus were evacuated. It was thinner and more serous than that removed on the first occasion.

Vespere.—Complains of a "burning sensation" in the liver, but no actual pain: the hepatic distension has subsided. Pulse 112, temperature 99°2′F.

11th day.—Easier. Has slept fairly. "Burning sensation" less. Pulse 116, temperature 98°7′F.

Vespere.—Pulse 128, temperature 98°8′. Takes nourishment well.

15th day.—On percussion over the liver a clear tympanitic note is evolved, indicating the distension of the abscess cavity with air. The eleventh costal cartilage crepitates on pressure, and the skin immediately above it is red, angry-looking and œdematous. Pulse 112, temperature 99°2′F.

Vespere.—Stomach irritable: has vomited his food to-day. Temperature 99°4′F., pulse 104.

18th day.—Temperature 97°5′F., pulse 112. Hypochondrium less distended: no pain.

Vespere.—Has suddenly become very low this afternoon. Is perspiring; extremities cold; pulse scarcely perceptible. Has vomited a little glariy thin fluid two or three times. Respiration and deglutition difficult.

October 20th (*19th day*).—Died at 3 A.M. During the last twelve hours diffusible stimulants in large quantities were administered, but failed to relieve the somewhat sudden and intense collapse into which the patient had fallen.

Post-mortem Examination, five and a half hours after death.—Right hypochondrium bulging. The marks of two punctures visible between the ninth and tenth ribs, just anterior to their angles,—one healed, the other only partially so. On opening the abdomen, both layers of the peritoneum were found vividly injected, and coated with a thick layer of recent inflammatory effusion: the coils of the small and large intestines were matted together: nearly a pint of dark brown serum was collected from the peritoneal cavity.

The under surface of the right lobe of the liver was separated from the stomach, deodenum and colon by a thick double-layered false membrane, which extended from the under surface and lower border of this lobe to the anterior superior spine of the ilium and anterior abdominal wall. The greater part of the right lobe of the liver was hollowed out to form an enormous abscess cavity, the anterior and outer walls of which were formed, not by hepatic substance, but by the lower

intercostal spaces and ribs and the abdominal muscles, and behind and below, this cavity appeared to be shut off from the general peritoneal cavity by the thick double false membrane above described. The upper part of this space contained only fœtid gas, the pus having gravitated to the lower and back part, it was thick, curdy and flaky, cream-like, pink, and measured about four pints in quantity.

Four small circumscribed depôts of "yellow softening" were visible on the under-surface of what remained of the right lobe.

The upper border of the liver was firmly adherent to the diaphragm.

The left lobe was flattened out, reaching the spleen. On section it was greasy and soft, not otherwise altered.

The eighth, ninth, tenth, eleventh, and twelfth ribs, and the lower intercostal cartilages were denuded of periosteum, rough, and partially necrosed.

The *shell* of the liver on removal weighed 2lbs. and 13ozs.

The mucous membrane of the *stomach* was soft and greyish; that of the *small intestines*, was for its upper half discolored (dark-slaty in appearance), the lower half being pale, and exhibiting prominent solitary and agminate glands, but no ulceration. The mucous surface of the *large intestine* was corrugated, of a rose pink color in the ascending colon and hepatic flexure, but presented no trace of glandular lesion or ulceration. The other organs were all examined, but nothing remarkable discovered.

Remarks.—It will be noticed from the history of this case that the patient distinctly traced the hepatic disorder to an attack of Dengue, from which he had suffered four months previous to admission. Before this illness he never remembered to have felt any uneasiness or pain in the liver. His habits were intemperate, and very probably the organ was not a sound one,

and *hence* more than usually liable to both functional and organic derangements on the supervension of any acute general disorder. At any rate, the apparently undoubted association of the hepatitis with *Dengue* is worthy of a passing notice, and is perhaps deserving of record in the list of casualties which have attended the recent epidemic.

With reference to the necrosis of the ribs and costal cartilages found after death, it is to be remarked, that this condition is not unfrequent after operations on the liver performed through the intercostal spaces, and is, therefore, a further reason why puncture through the abdominal wall should be preferred whenever practicable.

One hundred and fifteen ounces of pus were evacuated during life, and about four pints were found *post-mortem*; this will give an idea of the size of the abscess operated upon.

There was no history of dysentery given by the patient, and no lesions were met with in the intestinal canal indicative of this disease. For the diurnal temperature of this case, see Chart No. 2, p. 71.

Case No. VI.—John D——, an East Indian, was admitted on the 28th October 1872.

History.—States that four months ago he suffered from an acute attack of dysentery, which lasted one month. This was followed, two months later on, by severe pain in the liver, and fever. For the latter—under the denomination of "acute hepatitis"—he was treated as an in-patient in this hospital, and was discharged—"relieved"—after nineteen days. During the last week, both the hepatic pain and the fever, which is of proxysmal type, have returned.

Present condition.—Feels feverish, but the thermometer shows only a temperature of 98°F. Has acute pain, with great tenderness on pressure, all over the hepatic region, and pain in the right shoulder. Has a dry cough. The bowels are constipated. No jaundice. Tongue coated. Thirsty. No appetite. There

is no positive enlargement of the liver, nor of the spleen, but the right hypochondrium by contrast looks more distended than the left. No fluctuation can anywhere be detected over the liver.

3rd day.—Hepatic pain still persistent and severe. Pulse 76, temperature 98°F.

Vespere.—Pulse 80, temperature 100°F.

5th day.—Much easier to-day. Pain in liver less. Tongue moist and clean. Pulse 92, temperature 98°F.

Vespere.—Feverish. Pulse 80, temperature 101°5'F.

7th day.—The hypochondrium appears more enlarged and bulging than before, and fluctuation is suspected (deeply-seated) at one spot, the size of a shilling, between the eighth and ninth ribs, an inch and a half anterior to these angles. This part being explored, pus was found, and with the aspirator no less than *sixteen* ounces of thick, reddish, purulent fluid were evacuated. Pulse 76, temperature 98°F.

Vespere (after operation).—Pulse 64, temperature 98°. No pain.

8th day.—Feels greatly relieved. Slept well. Has no pain. Appetite improved. Pulse 84, temperature 98°F.

Vespere.—Pulse 78, temperature 98°6'F.

9th to 34th day.—The wound which was dressed antiseptically, healed in about forty-eight hours, and the patient has continued to do well since the operation. There has been no return of fluctuation in the liver, and no acute pain; but still some uneasiness and a "heavy feeling" are experienced in this part, and occasionally, shooting pain in the shoulders; it is, therefore, thought advisable to keep the patient for some time longer under observation.

65th day.—Has still, slight pain and uneasiness on pressure over the liver, but nothing more. There has been no return of fluctuation, and the organ is not enlarged. Pulse varies from 80 to 100. Temperature from 98° to 100°F.

96th day.—During the past *month* the patient has had one or two attacks of "ague," each lasting for a day or two, and the hepatic uneasiness has never completely subsided, but his general health has improved considerably, and there is no further evidence of suppuration in the liver.

February 25th (*121st day*).—Free from all pain both in the liver and shoulder. Temperature for the last month has been normal, never going above 99°F., and the pulse the same—76 to 90. Discharged.

Remarks.—During this patient's residence in hospital several other cases of hepatic abscess were admitted,* in some of whom, the relapses or reaccumulations took place so frequently, that it was deemed advisable to detain this patient as long as possible under observation, in order that his recovery should not in any way be questionable. For the last two months prior to his discharge he was quite convalescent, and there can be no reasonable doubt that the abscess which was tapped was a solitary one, and had entirely disappeared. The patient has never reapplied for admission.

There appears to have been some association in this case between dysentery and the hepatic suppuration. *Sixteen ounces* of pus in all were removed, and that by one operation. A Chart (No. 6) of this patient's diurnal temperature during the first fifteen days he was in hospital, (which includes a period of about a week before and after the operation), is appended, see p. 77.

Case No. VII.—A Bengali vagrant, aged 36, was admitted on the 31st October 1872.

States that for the last twelve months he has been in bad health, suffering from repeated attacks of intermittent fever so common in his district (Hooghly). Has only experienced pain and a feeling of distension in the region of the liver for the

* See cases VII, VIII, IX, &c.

last twelve days, during which period he has had a more than usually severe attack of quotidean fever.

Denies any addiction to spirit-drinking. Had "chancre" eight years ago, followed by "secondary symptoms," for which he was mercurialized (fumigated).

Gives no decided history of dysentery: has at any rate not suffered from any looseness of the bowels during the last six months.

Present condition.—Not much reduced in flesh. Able to walk about without much discomfort.

A circumscribed, oval swelling is seen in the epigastric and right hypochondriac regions; it occupies a space of about two square inches below the right costal cartilages. This part is very tender on pressure, and it is thought that fluctuation can be felt indistinctly towards the centre of the tumour. The liver appears to be pushed down and adherent to the abdominal parieties, there is no upward enlargement of the organ. Appetite pretty good. Bowels regular. Tongue slightly furred. Pulse 112, temperature 101°2′F.

The other organs of the body appear to be healthy. Has no enlargement of the spleen.

4th day.—Pulse 112, temperature 101°F. Abscess first explored and then *tapped* (through the abdominal wall at the spot above indicated) with the aspirator, and *three ounces* of thick creamy pus, having a reddish tinge, evacuated. The patient immediately expressed great relief.

Vespere.—Pulse 98, temperature 101°F. Has taken food well.

5th day.—Pain in the liver much less: altogether more comfortable. Pulse 108, temperature 100°2′F.

Vespere.—Pulse 104, temperature 102°6′F.

7th day.—The bulging in the hepatic region has subsided, and the parts here appear to be firm on pressure. Very little pain. Pulse 96, temperature 98°6′F.

10th day.—Uncomfortable. There is a bulging again below

the ribs, and fluctuation has returned in the hepatic tumour. At 10 A.M. abscess *again tapped* with aspirator, and *four ounces* of thick pus, having the same characters as before, and being quite "sweet," were removed.

11th day.—Pulse 76, temperature 99°F. Expresses himself as completely relieved from all pain. Has a dry cough.

12th to 16th day.—Continued to improve until to-day, when fluctuation was again observed in the tumour, and the patient complains of more pain and uneasiness in this part. Pulse 96, temperature 98°8′F.

18th day.—Pulse 96, temperature 99°6′F. Bulging of the hypochondrium with fluctuation more distinct. Abscess *tapped for the third time* with the aspirator, and *seven ounces* of pinkish, thick, odourless pus evacuated.

Vespere.—Much easier. Pulse 88, temperature 99°4′F.

19th day—Pain in the liver much less. The bulging has subsided. Pulse 92, temperature 98°8′F.

20th to 30th day.—There is a good deal of thickening and induration in the position of the abscess, but no fluctuation. General health of patient improving daily. Has lost all fever.

December 3rd (*34th day*).—Has been kept under careful observation, but no return of fluctuation in the liver can be detected. The indurated, thickened condition of the parts in the right hypochondrium has to a great extent disappeared. Discharged.

This patient was readmitted on the 28th December, *i.e.*, twenty-five days after his discharge.

He states that he returned to his native village after leaving the hospital, and remained well until about a week ago, when he began once more to experience pain in the hepatic region, with fever, and swelling and distension of the hypochondrium. The hepatic tumour has increased to the size of a large orange, and nearly reaches the umbilicus. The most prominent part is about three inches below the ensiform cartilage, and an

inch to the right of the median line. Indistinct fluctuation apparent over this spot, but the palpation of the tumour is rendered difficult owing to the great density and thickening of the superficial parts, and the great tenderness experienced on the exertion of any pressure.

6th day (*after second admission*).—Has been carefully observed during the past five days. The fluctuation in the tumour is now quite distinct, and pain and tenderness over the part have gradually increased. The patient has passed a restless night, and the temperature last evening rose to 101°F.

The abscess was tapped for the *fourth time* with the largest size cannula and trochar of Dieulafoy's apparatus, the puncture being made at a spot three and a half inches below and to the right of the ensiform cartilage. *Eight ounces* of thick reddish brown pus were evacuated. It was found to be free from all odour. Wound dressed antiseptically.

Vespere.—Feels greatly relieved, and has taken food well. Pulse 100, temperature 99°F.

7th day.—Feels very comfortable; has slept well: tongue clean and moist. Pulse 84, temperature 98°F.

8th day.—On removal of the "dressing" to-day, *one ounce* of pus found beneath it (quite free from odour). The hepatic swelling has considerably subsided. Pulse 82, temperature 98°F.

11th day.—The discharge in small quantities continues. Cupping glasses applied over the unhealed puncture, and *half an ounce* of thick pus thus removed. Pulse 76, temperature 97°5′F.

12th day.—Passed four stools with griping and tenesmus. Each contains a little gelatinous mucus. *Two drachms* of pus removed by the use of cupping glasses from the abscess, which still "weeps;" the surrounding parts, however, are indurating.

15th day.—All discharge has ceased; the external wound has quite healed; hepatic dulness in every direction much reduced. No pain or uneasiness in this part. General health improves daily. Pulse 82, temperature 97°.

Vespere.—Pulse 78, temperature 98°6′F.

16th to 29th day.—Has improved steadily. During the past fortnight a belladonna plaster has been applied over the indurated mass in the right hypochondrium, which indicates the remains of the abscess cavity, and has appeared to soften and remove this condition to some extent. Some thickening and prominence of this part, however, still remain, but no fluctuation can be obtained on the most careful and diligent examination. Patient quite convalescent and walking about. Discharged to-day, January 25th, 1873.

Readmitted on the 5th February, eleven days after second discharge.

States that while proceeding by rail (at night) to his native village, experienced a "chill," which was followed by fever and a return of severe pain in the hepatic region. This part has since become as distended and prominent as before. The tumour occupies the same position as has already been described, but appears to be larger—about the size of a fœtal head; a great portion, however, feels pretty solid, and fluctuation is limited to a circumscribed central spot. The area of hepatic dulness extends from the sixth rib to the level of the umbilicus. Evening temperature 100°F., pulse 104.

3rd day (*of third admission*).—Temperature 98°2′F., pulse 80. Abscess tapped this morning for the *fifth* time with Dieulafoy's aspirator (an inch and a half above the umbilicus, and an inch to the right of the median line), and *one ounce and a half* of thick pus evacuated. The instrument again out of repair and works imperfectly.

Vespere.—Much relieved by the operation. Pulse 100, temperature 99°6′F.

5th day.—Fluctuation has reappeared in the liver. Pulse 80, temperature 98°2′F.

8th day.—The abscess has been "pointing" externally, during the last two days, the superficial parts becoming gradually thinned. As the aspirator was unserviceable, the skin over the

tumour was allowed to give way spontaneously, this occurred during the night, and *three ounces* of pus with some bloody serum have escaped this morning, to the great relief of the patient. Temperature 99°2'F, pulse 100.

Vespere.—Pulse 104, temperature 100°8'F.

12*th day.*—About *one ounce* of pus has dribbled from the hepatic fistula daily. Antiseptic dressing is applied over the part. The tumour is gradually subsiding, and the discharge becoming thinner in character. Pulse 88, temperature 98°F.

Vespere.—Pulse 86, temperature 99°F.

17*th day.*—The external opening of the fistula having almost closed, and yet fluctuation being perceptible, the tumour was tapped with an ordinary small-sized trochar and canula (Dieulafoy's instrument being still out of repair), and *one ounce* of pus was removed—thick, pinkish, and odourless. Pulse 84, temperature 99°F.

March 25th (44*th day*).—Small quantities of matter have daily escaped from the abscess, latterly amounting to only a drop or two on the under-surface of the dressing. There is no fluctuation to be felt at any part of the tumour; it has contracted very considerably and feels everywhere quite hard and firm. The patient's health has greatly improved: he has become stout, and feels strong and well. The pulse and temperature for the last four weeks have been quite normal. Discharged to-day at his own request.

Remarks.—This case exhibits in a marked manner the chronic character of hepatic suppuration occasionally met with, and yet the fair amount of general good health which may accompany the process. The patient was first admitted on the 31st October 1872, and was finally discharged on the 25th March 1873, so that, with intervals of but a few days, he was under observation for a period of about five months.

The abscess was *tapped* altogether *six times*, on five occasions with the "aspirator," and once with an ordinary trochar and

cannula. The pus evacuated by these operations amounted to *twenty-four and a half ounces*, and during his second admission into hospital *three and a half ounces* more, partly escaped, and in part were removed by cupping glasses. Further, during the period of his third residence in hospital, small quantities again escaped daily from the fistulous opening, which may be roughly estimated at about *ten ounces*, so that in all the discharge from the liver amounted to about *forty ounces* of pus.

The connection between dysentery and hepatic suppuration in this case is obscure. The patient denied having suffered from disordered bowels during the six months previous to admission. Before this time he had apparently suffered from *diarrhœa* (?).

Only *once* during the whole term of his residence in hospital is there any note of his having passed mucoid stools.

The ultimate recovery of the patient cannot be fairly attributed to the use of Dieulafoy's aspirator, yet the case illustrates the amount of benefit temporarily accorded by each aspiration. The external pointing of the abscess and its rupture in this direction was the salvation of the patient: all other means had failed to afford permanent relief.

The man has not since his last discharge reported himself again at the hospital. I presume he would have reapplied for admission had the hepatic lesion once more assumed a serious aspect.

Case No. VIII.—A Bengali, alleged age 45 (probably older), was admitted on the 21st November 1872.

The patient was carried into the ward by friends, and was so weak and collapsed that no connected history could be obtained from him; but his brother—who resides in the same house—states that the patient was attacked with *Dengue* six weeks ago,—the fever lasting one week, and being accompanied by pains in the joints, a scarlet eruption, &c. One month previous to this he was laid up with severe continued or quotidean fever (the exact nature not

ascertainable) for fifteen days. During the attack of *Dengue* became greatly prostrated, and first experienced severe deep-seated pain in the region of the liver. This gradually increased, and was followed in a few days by a bulging of this part. Both the pain and hepatic swelling continue, but the patient has no distinct fever paroxysms now, nor has he had any for about fifteen days prior to admission.

Present condition.—Very emaciated and "worn to a skeleton." Has scarcely taken any nourishment for the last fifteen days. Voice very feeble; speaks chiefly in whispers. Cannot even sit up in bed without support. Has great pain all over the liver, which is considerably enlarged, the hepatic dulness extending across the epigastric into the left hypochondric region; below, it reaches the umbilicus, above, the fourth intercostal space. All this part is bulging and prominent, smooth, rounded, indistinctly circumscribed: the recti muscles tense, the skin shiny, stretched and œdematous. Fluctuation is distinct at a point midway between the ensiform cartilage and the anterior extremity of the last rib, about two inches below the right costal cartilages.

The tongue is dry, and covered with a thick brown fur. The bowels are constipated (the patient has never suffered from dysentery). Pulse small and weak—90; temperature 96°5′F.

2 P.M.—Temperature has risen to 98°F.

Vespere.—Very restless, only able to swallow a little milk with brandy. Pulse 100, temperature 99°5′F.

2*nd day.*—Has taken nourishment a little better during the night, and is not so restless. Slept very little. Pulse 90, temperature 96°F.

Agreed in consultation to operate.

At 10-30, after exploration, the "aspirator" was employed, and *sixty-four* ounces of pus were evacuated without difficulty. The first twenty ounces were thin, sanious and distinctly fœtid; the last, thick, reddish-grey, cream-like. The matter was acid

in reaction; and the specific gravity of the thinner portion, 1040.

The patient was supported with small repeated doses of brandy and water during the operation, and expressed himself greatly relieved after it.

Vespere.—All hepatic tenderness and pain have disappeared. Has taken food better. Pulse 80 (increased in volume), temperature 99°4′F. Unable to pass urine,—relieved by catheter.

11 P. M.—Troubled with hiccup. Temperature 98°2′F.

3*rd day.*—Feels much better; slept pretty well; no hiccup. Hepatic tumour has entirely disappeared. Voice stronger. Pulse 84, small, but firmer than yesterday decidedly. Temperature 98°5′F.

Vespere.—Clearness on percussion over the right front of the thorax to an inch and half below the nipple. Urine has again to be drawn off by catheter. Complains of no pain whatever over the liver. Pulse 90, temperature 99°5′F.

4*th day.*—Did not sleep well last night. Has, however, taken nourishment fairly. No pain whatever in the abdomen. Pulse very feeble—84; temperature 97°5′F. Voice has again become husky.

Swallows with some difficulty this morning. Ordered nutrient enemata.

9 P.M.—Has just expired. Became more and more low after last visit, and gradually sank without pain.

A *post-mortem* examination was not allowed by the friends, although it was very pressingly urged upon them.

Remarks.—This from the first was a hopeless case, and the operation was only attempted as a *dernier ressort*, and after careful consultation among the hospital staff.

The history of the disease is somewhat ambiguous. After repeated questioning and cross-questioning, information as to the duration of the hepatitis extended no further back than six weeks, and was always traced to the attack of *Dengue*, faithfully

described by the patient's brother. This is the second case in which the same association has been noticed.

The fœtid character of the pus first evacuated would appear to indicate that decomposition to a certain extent had already commenced in the abscess.

Case No. IX.—A Bengali, aged 24, was admitted on the 7th December 1872.

For the last six months has been suffering from intermittent fever and enlargement of the spleen. The fever comes on at irregular intervals. The last attack dates one month back, and continues still. A fortnight ago, experienced sharp stabbing pain in the right hypochondro-epigastic region, and after a few days noticed a small swelling here. This has gradually increased. Has never suffered from dysentery or diarrhœa. Has never had syphilis, and always led a temperate life.

Present condition.—A fairly nourished, strong-built man. In the right hypochondro-epigastric region is a tumour, the size of an orange, which fluctuates distinctly on pressure. The skin and abdominal wall appear to be tied down to the tumour, for they cannot be pinched up between the fingers. Hepatic dulness extends below to within two inches of the umbilicus; here the rounded abrupt body of the liver can readily be felt; above, it reaches the right rib.

The spleen is much hypertrophied, reaching the umbilicus below; it feels hard and tense. Tongue moist and clean; appetite fair. Has a slight "dry" cough.

6 P.M.—Pulse 103, temperature 101°F.

4th day.—Pulse 100, temperature 98°F. Hepatic tumour explored and then *tapped* with the aspirator (one inch and a quarter below and to the right of the ensiform cartilage). The largest sized cannula and trochar of Dieulafoy's aspirator were used. *Four ounces* of thick, reddish pus removed, neutral in reaction, free from all odour.

Vespere.—Pulse 104, temperature 100°4′F.

5th day.—Very little tenderness over the liver. Swelling has subsided. Feels much easier. Pulse 108, temperature 99°4′F.

Vespere.—Pulse 104, temperature 100°F.

9th day.—Pulse 104, temperature 99°F. The hypochondrium has again become prominent, and at one spot, just beneath the puncture (which has healed), fluctuation has reappeared. The aspirator again used, and through the same puncture, with the same sized trochar and cannula, *four ounces* more of thick pus evacuated. It is reddish, free from odour, faintly acid in reaction.

Vespere.—Pulse 114, temperature 100°F.

15th day.—Up to within the last forty-eight hours no fluctuation could be felt in the hepatic tumour, only a very considerable amount of hardening and firmness of the tissues at this part; but to-day, fluctuation is again very distinct, and great pain is complained of by the patient. Pulse 112, temperature 99°4′F. The abscess was *tapped* (in the same way) *for the third time*, the puncture, however, being made half an inch below the first one. *Five and a half* ounces of sanious pus were removed. The fluid is thinner than before, but without odour, and neutral in reaction.

Vespere.—Pulse 104, temperature 99°4′F. Much relieved. Has taken food well.

17th day.—This morning, on removing the antiseptic dressing placed over the puncture, *one ounce* of laudable thick pus was found beneath it. Pulse 88, temperature 93°F.

27th day.—From half an ounce to an ounce of pus has oozed daily through the last hepatic puncture; but fluctuation still persisting in the tumour, a cannula was introduced, and *an ounce and a half* of thick pus evacuated by means of the aspirator. All the induration which a few days ago existed seems to have become absorbed, and the parts are now soft and baggy.

The spleen has become greatly reduced in size, and scarcely exceeds normal limits. Pulse 96, temperature 97°4′F.

Vespere.—Pulse 80, temperature 98°4′F.

35*th day.*—About *an ounce* of pus escapes daily from the abscess: its removal is facilitated by the application of cupping glasses.

To-day, fluctuation can be felt more deeply situated, and the aspirator was again used, but only *one ounce* of pus came away. The cavity of the abscess was then washed out with a weak solution (1—100) of carbolic acid, and the part dressed antiseptically. Pulse 84, temperature 97°41′F.

Vespere.—Complains of a little burning after the use of the carbolic acid solution. Pulse 96, temperature 98°6′F.

43*rd day.*—The abscess cavity had contracted very considerably since the last operation, so much so, that the tip of the finger only could be inserted into its hollow (or the depression corresponding to its site), but yesterday, a strong rigor followed by fever has prostrated the patient, and this morning *six drachms* of pus were found beneath the dressing. The cavity was again washed out with a weak solution of carbolic acid. Pulse 100, temperature 98°F.

Vespere.—Temperature 99°8′F., pulse 100.

48*th day.*—The first puncture into the abscess cavity (which had healed) has given way, and now from both openings a free discharge of pus takes place daily. The pus, however, is assuming a fœtid odour, and the parts around are again baggy and œdematous. The septum between the two punctures was divided this morning with a probe-pointed bistourie (under carbolic spray), and exit thereby given to *an ounce and a half* of fœtid pus. The cavity was then washed out with carbolic acid solution, and a small guttapercha drainage tube introduced. Pulse 92, temperature 98°4′F.

Vespere.—Pulse 96, temperature 98°6′F.

60*th day.*—Discharge has continued through the drainage tube

daily, varying in amount from *an ounce* at first, to *two drachms* latterly. Considerable induration and thickening of the subjacent parts is observed, and as the fistula had contracted very closely round the drainage tube, the latter was removed to-day, and the wound simply dressed with lint soaked in carbolic oil (1 to 20). Temperature 98°4′F, pulse 100.

84*th day.*—Very little discharge. Liver substance much indurated and firm. The wound is looking healthy, and daily becoming smaller. Patient has lost all fever, and is gaining flesh. Pulse and temperature are now quite normal.

115*th day.*—Fistula quite superficial, only a few drops of pus escape daily. The patient has become quite stout, and is in every way much improved in health.

April 6th, 1873 (121*st day*).—Discharged "cured."

Remarks.—This was a very protracted case of hepatic suppuration. The abscess seems to have been situated quite superficially in the right lobe. *Five* "aspirations" were performed on the patient, and by this means *sixteen ounces* of pus were removed; but the quantity which altogether escaped, by draining and other means, could not have been less than from *eighty to one hundred ounces*. An error, I think, in this case, was the evacuation of the abscess *twice* through the same opening with the largest sized cannula and trochar of the aspirator. When placed thus superficially, the second sized trochar and cannula (being a good deal finer and smaller in calibre) are preferable, and are much less likely to lead to the establishment of a fistulous communication, with consequent leakage from the abscess, and the unavoidable entrance of air into the abscess cavity. The recovery of this patient can, therefore, only partially be attributed to the use of pneumatic aspiration.

It is to be noted that, for about the last two months the patient was in hospital, he was free from all fever and hectic; the pulse and temperature during this period remained quite normal; and notwithstanding the constant drain from the

abscess, he improved steadily in health, gaining flesh and weight. The enormous spleen, also, with which he was admitted, entirely resumed natural limits before his discharge.

In this case there was no history of dysentery, nor were there any symptoms of this disease exhibited during the patient's residence in hospital.

Case No. X.—A Brahmin priest, aged 40, was admitted on the 27th December 1872.

History.—Has enjoyed good health up to within the last five months; during the latter period, he has been suffering on and off—a few days at a time—from intermittent fever. Four months ago first suffered from dysentery, the attack lasting one month. Three or four weeks ago first experienced uneasiness and some tenderness in the hepatic region; this was followed by the appearance of a small globular tumour—the size of a duck's egg—in the epigastrium, which has since increased. Has always led a temperate life. Never had syphilis.

Present condition.—A strong, robust-looking, middle-aged man.

In the hyposternal arch, a little to the right of the median line, is a fluctuating, smooth tumour, the size of an orange. The skin and abdominal parieties are adherent over it. The general area of hepatic dulness is somewhat increased, extending downwards for three inches below the ribs, and above as far as the eighth rib.

All other organs of the body appear to be healthy; spleen not enlarged; appetite fair; bowels a little loose. In the *evening* the temperature recorded is 101°4′F. Pulse 108, small but regular.

3*rd day.*—Pulse 104, temperature 98°F. The hepatic tumour was this morning first explored and then *tapped* with the aspirator at a spot an inch and a half below the ensiform cartilage, and a quarter of an inch to the right of the median line. The large sized trochar and cannula were used, and *four ounces* of thick reddish pus evacuated. It was slightly acid in reaction, and odourless. The puncture was dressed antiseptically.

Vespere.—Feels much relieved, and has taken food well. Pulse 108, temperature 100°F.

7*th day.*—Fluctuation has returned in the hepatic tumour during the last two days. Patient uncomfortable, complains of much pain in this part, and difficulty in respiration. Could get no sleep at night. Pulse 100, temperature 99°6′F. The abscess *tapped again* with aspirator this morning—(the same sized trochar and cannula being used),—one inch below the ensiform cartilage. *Four ounces* of pus were evacuated, thick, free from all odour, slightly acid in reaction.

Vespere.—Completely relieved. Pulse 84, temperature 99°8′F.

11*th day.*—The swelling, which had completely subsided on both occasions after the operations, to-day feels somewhat soft and baggy, and the lower puncture has given way, allowing of slight dribbling from the opening. By means of a cupping-glass one ounce of pus was removed. Pulse 92, temperature 99°F.

Vespere.—Pulse 96, temperature 100°F.

16*th day.*—Lower opening into abscess nearly closed, discharged very small, but fluctuation distinctly felt beneath this spot. Pulse 82, temperature 98°F. No. 2 trochar and cannula passed into the upper opening, and *half an ounce* of sanious pus, thinner than before, but still free from fœtor, removed by means of the aspirator.

Vespere.—Pulse 96, temperature 99°4′F.

21*st day.*—Lower puncture has reopened during the last three or four days, and a discharge of from *half an ounce* to *an ounce* of sanious pus partly escapes, and in part is brought away by cupping-glasses. The second sized trochar was passed through this opening to-day so as to give a freer exit to the discharge, and with the aspirator *five ounces* of thick reddish pus were evacuated. Pulse 96, temperature 98°4′F.

23*rd day.*—No permanent relief. Fluctuation in the tumour again very evident, and all discharge from the lower puncture

has ceased. Pulse 76, temperature 98°F. The abscess was tapped for the *fifth time* with No. 2 trochar and cannula through a fresh opening an inch and three quarters below and to the right of the ensiform cartilage. *Two and a half ounces* of thick hepatic pus were evacuated, and the abscess cavity washed out with a weak solution of carbolic acid (1—100).

Vespere.—Pulse 96, temperature 99°2′F.

25*th day.*—The abscess is again full and fluctuating. Patient complains of burning pain in the part. Pulse 96, temperature 99°6′F.

A blunt pointed bistourie was introduced into the lower puncture, and the abdominal wall divided for about an inch in an upward direction. The cavity of the abscess was thus freely exposed, and *six ounces* of thick pus escaped. A drainage tube was introduced.

Vespere.—Pulse 108, temperature 100°F.

37*th day.*—Discharge to the amount of about half an ounce escapes daily through the drainage tube—(a fresh tube is introduced every morning, and the whole dressed antiseptically). Last evening the patient had a severe rigor, and this morning the edges of the fistula are looking as if about to slough: there is a scarlet blush over the skin surrounding the opening, reaching upwards also as far as the right nipple. Pulse 104, temperature 100°2′F.

Vespere.—Skin more angry-looking, red, and œdematous (erysipelas). Thirsty; tongue dry. Pulse 120, temperature 103°F.

Part painted with strong solution of nitrate of silver.

47*th day.*—The erysipelas subsided in about three days, but the lower fistulous opening has wide gaping sloughy edges, and the upper puncture has reopened. From both, about half an ounce of pus, through the drainage tube, is daily discharged. The isthmus of skin separating these openings was to-day divided, *one ounce* more of pus escaped from the abscess cavity, which

was then stuffed with lint soaked in carbolic oil (1 to 20.) Pulse 86, temperature 98°4′F.

Vespere.—Temperature 98°6′F., pulse 92.

54*th day.*—Nothing but a large, almost superficial, ulcer is now to be seen: the abscess cavity, which appears to have been quite superficial, has granulated from the bottom. The edges of the ulcer are healthy; the discharge sweet and very scanty. Patient's general health rapidly improving. Has no pain or tenderness over the liver. Pulse 84, temperature 98°2′F.

82*nd day.*—Has steadily improved. The superficial ulcer has contracted to the size of a five-shilling piece, and looks very healthy. No fluctuation can be felt in the liver on most careful examination. The organ is much reduced in size, contracted, firm, and free from all pain or tenderness. General health excellent.

101*st day.*—Ulcer almost healed, is now about the size of a shilling. Discharged to-day at his own request.

Remarks.—This case is an almost exact duplicate of the preceding one,—indeed, both patients were admitted about the same time, and were treated side by side in the same ward. It would have been better here again, probably, to have tapped the abscess in the *first* place with No. 2 cannula and trochar, and to have made *separate* punctures with the same instrument for the subsequent aspirations. Both these cases show that however successful an aspiration may be, it does not in any way control subsequent reaccumulation of pus.

Sixteen ounces of pus were removed by means of the aspirator, from ten to twelve ounces by cuppings and free incisions, and not less than fifteen or sixteen ounces more escaped by drainage and self-leakage from the abscess cavity, so that the total amount of discharge in this case cannot be reckoned under fifty ounces.

There was a distinct history of dysentery given by the patient,

and for the first few days after admission the stools contained mucus.

Careful notes of the diurnal temperature in both this and the preceding case have been taken, and are introduced into the summarized accounts here given as far as possible, but no attempt has been made to exhibit the same in the form of regular charts, since these would be two large for publication, extending as the term of residence in hospital does in each case for over a hundred successive days.

Case No. XI.—M. N.——, an Irishman, formerly a soldier, now an engine-driver, aged 39, admitted on January the 13th, 1873.

History.—As an engine-driver on the railway, has been considerably exposed to the weather and vicissitudes of temperature. Has been in the habit of drinking five or six quarts of beer daily. In 1854-55 was in the Crimea, and remembers then to have suffered from dysentery,—not since. Two months ago had a severe attack of "fever and ague" accompanied by pain and fulness in the right side. Both have continued since, the latter increasing daily.

Present condition.—Greatly emaciated. Skin pale and sallow. Lower extremities œdematous, especially the right leg and foot. Is extremely weak and depressed. The right side of the chest and abdomen bulge. Hepatic dulness extends as high as two inches above the right nipple, below, to within half an inch of the umbilicus. All this part is very tender to percussion. The superficial abdominal and thoracic veins are dilated and tortuous, distinct fluctuation perceptible below the costal arch, specially at one spot, one inch and a half below and to the right of the ensiform cartilage.

Can only lie in tolerable comfort on his back, not on either side. Temperature 101°F.; pulse 104, small, weak, thready. Pupils dilated.

2*nd day.*—Passed a restless night. Pulse 105, temperature 97°6′F. The abscess was first explored and then *tapped* this morning with Dieulafoy's aspirator, the puncture being made at the spot at which fluctuation seemed most distinct (below the ribs). *Fifty ounces* of sero-purulent fluid were evacuated: thin and dark-brown in colour at first, afterwards thicker and muddy in appearance. The reaction of the fluid was slightly acid.

Vespere.—Pulse 124, temperature 101°F., respiration 32. Much relieved. Free from all pain.

3*rd day*—Pulse 100, small and feeble. Temperature 101°8′F., respiration 28. No pain felt in the liver except on coughing. Has slept well. Tongue clean and moist.

Vespere.—Temperature 102°F., pulse 116, respiration 28. Complains of a little fulness and heaviness in the hepatic region, but no pain.

6*th day.*—Perspired very copiously last night. Complains of a troublesome cough. Coarse moist crepitation occupies the posterior borders and bases of each lung (œdema pulmonis). Fluctuation has returned in the hepatic tumour. Pulse 120, temperature 101°2′F., respiration 40.

Abscess *tapped for the second time* at the same spot, and thirty-two ounces of thin dark sero-pus evacuated with the aspirator.

Vespere.—Feels relieved by the operation, but is greatly exhausted. Pulse 128, temperature 100°2′F., respiration 40.

7*th day.*—Pulse 112, temperature 99°6′F., respiration 44. Slight pain in the liver.

Vespere.—Pulse 120, temperature 102°4′F., respiration 40.

9*th day.*—No pain in the liver, but a good deal of distension is felt here, and fluctuation is distinctly perceptible. Pulse 120, temperature 99°8′F., respiration 36.

Vespere.—Complains of great difficulty in breathing; the hypochondrium is bulging and very prominent. Pulse 128, very small, barely perceptible. Temperature 103°F., respiration 52. Abscess *tapped for the third* time this evening, and *seventy-four ounces* of thin sero-pus again evacuated by means of the

aspirator. The fluid has a sour unwholesome smell, is acid in reaction, and has a specific gravity of 1048.

10*th day.*—Passed a fairly good night, and feels greatly relieved. No pain whatever in the liver. Loud moist râles heard over the greater portion of both lungs posteriorly. Pulse 140, temperature 100°F., respiration 32.

12*th day.*—Very low. Pulse quite thready—140; temperature 100° F.; respiration hurried, shallow, accompanied by sonorous sounds, 60 per minute. Abdomen tympanitic; pupils dilated.

3 P.M.—No pulse perceptible at the wrist. Body cold and bedewed with clammy sweat.

3-45 P.M.—Has just expired.

No *post-mortem* examination was allowed by the friends of the patient, although urgently requested.

Remarks.—This was a hopeless case from the first. The patient was brought to the hospital in too low and exhausted a condition for much hope of permanent relief.

The contents of the abscess were from the first unhealthy in character, thin, sero-purulent, offensive, incipiently decomposed. This also rendered the prognosis very unfavorable.

One hundred and fifty-six ounces of sero-pus were evacuated during life. The abscess must have been an enormous one.

A chart (No. 3) of this patient's diurnal temperature is appended—*see* p. 73.

Case No. XII.—Matthew, J., an East Indian, aged 40, the steward of a coasting steamer, a robust and well-made man, was admitted on the 20th of January 1873.

States he had enjoyed good health until the last three months; during the latter period he has suffered from intermittent fever almost daily. Four weeks ago first experienced pain in the liver, this has never abated; for the last three days it has been especially severe, so much so, that he finds himself unable to breath freely, or to lie comfortably on either side. Has had a dry cough for the last fortnight.

Has never, as far as he can recollect, suffered from dysentery. Has lived "freely." Had syphilis about twelve years ago.

Present condition.—The patient has a *peculiar worn expression of countenance*. Eyes slightly jaundiced; tongue dry and coated; skin cold, perspiring. Temperature 96°F., pulse 104, small and weak, respiration 26. Troubled with a short spasmodic cough; no expectoration. The bowels are constipated. Complains of pain with tenderness on pressure over the whole right hypochondrium and right infra-mammary and infra-calvicular regions. The liver is enlarged and descends two fingers' breadth below the ribs; its upper boundary reaches to within an inch and half of the right nipple; the lateral dimensions are also increased.

Vesicular respiration strong all over the left side of the thorax; weak and distant on the right side, and accompanied by a few moist sounds at the right posterior base.

Urine scanty and high-coloured.

Vespere.—Pulse 120, temperature 102°8′F., respiration 32.

2*nd day.*—Pain and tenderness over the liver much less. Tongue moister; dry cough continues. Pulse 124, temperature 99°8′F., respiration 28.

Vespere.—Pulse 120, temperature 102°8′F., respiration 32.

5*th day.*—Cough very troublesome: expectoration scanty, grey, muco-purulent. Much prostrated. Pulse 112, temperature 101°F., respiration 36.

Vespere.—Skin pungently hot, temperature 104°2′F., pulse 132, respiration 40.

6*th day.*—Has had no sleep. During the night passed six scanty, dark, bilious stools. Tongue dry and hard; pain over the liver severe. Temperature 102°4′F., pulse 108, respiration 26.

7*th day.*—Restless all night, and at times delirious. Pulse 104, soft and weak, temperature 102°4′F., respiration 42.

Vespere.—Complains of difficulty in swallowing. Pain and

tenderness in the hepatic region continue severe. Breathing hurried. Pulse 128, temperature 102°8′F., respiration 42.

8th day.—Extremities cold. Temperature 96°F., pulse small and feeble, respiration 32. Tongue dry and brown. Has past a restless night, and was at times delirious. Cough less; no expectoration.

Vespere.—Delirious at intervals throughout the day; very restless: a good deal of *subsultus* present. Has taken very little nourishment. Pulse 108, respiration 44, temperature 102°6′F.

9th day.—Has had a severe rigor this morning. Temperature 102°F., pulse 96, small and compressible, respiration 40. Delirium and subsultus continue. Has passed during the night several reddish-colored liquid stools (about a pint in all). On "washing," a number of blood-clots, each about the size of half a walnut, and some liquid fœcal matter, were obtained. The liver has been examined carefully every day, but not until this morning has any fluctuation been ascertainable in the organ. Now, however, at one spot—a space about two inches square—about half an inch below and to the right of the ensiform cartilage, it is thought slight fluctuation does exist. This part was, therefore, explored (at 10-30 A.M.), and pus having been found, the aspirator was employed, and one *ounce and six drachms of* reddish brown or chocolate-colored thin pus evacuated. After the operation the patient's temperature was taken every two hours, and gave the following results:

12-30 P.M. ... 101°5′F.
2-30 „ ... 101°3′F.
4-30 „ ... 101°0′F.
Vespere.—6-30 „ ... 101°0′F.

Pulse small and intermittent, respiration 54. Very low; mind wandering; subsultus remains; passed urine in bed-clothes; abdomen tympanitic and tender on pressure.

10 P.M.—Perspiring profusely: quite collapsed. Pulse

scarcely perceptible at the wrist. Temperature 97°F., respiration 44.

11 P.M.—Has just expired.

Post-mortem Examination, eleven hours after death.—Liver large: extensively adherent by the whole of its upper surface and superior border to the diaphragm, and by its under surface to the stomach, pancreas, and hepatic flexure of the colon. Capsule opaque, and everywhere greatly thickened.

Situated quite superficially in the *left* lobe (upper surface), immediately to the left of the suspensory ligament, is an abscess cavity, the size of a small orange. Its walls are soft and ragged, and it contains *an ounce and a half* of thin chocolate-colored pus, and a few soft dark blood coagula. On making sections in various directions through the left lobe, numerous circumscribed patches of acute (red) softening were found, and a few also, opaque, and reddish-yellow in color, as if passing into the suppurative stage.

The whole of the right lobe presented on section a dull-red or muddy-color, but no softening or abscess could anywhere be detected. The gall-bladder was distended with thin, pale-yellow, almost colorless, bile. The weight of the liver was 4lbs. 15 ozs.

The mucous membrane of the small intestine was of an ash-grey color and softened in the ileum, where also, on the upper (ileac) aspect of the ileo-cœcal valve, two small superficial ulcers were found.

The *large intestine* presented no lesion worthy of remark. The mucous membrane was soft, but healthy.

All the other viscera were tolerably normal, except the *brain and meninges*, both of which were highly vascular, and the cerebral ventricles contained much serous effusion.

Remarks.—This case is, in many respects, an interesting one. The symptoms were acute from first to last. The temperature always high; and cholæmia present from an early date. The

removal of the *ounce and three quarters* of pus during life failed to afford relief; this, doubtless, was owing to the multiple character of the suppurative process going on in the liver, as demonstrated after death. Attention, however, is directed to the fact that the pus was discovered entirely through the use of the aspirator, and this case illustrates the usefulness of the instrument in a diagnostic point of view.

A Temperature Chart (No. 4) of this case is appended, see p. 73.

Case No. XIII.—T. R. V——, an European, aged 35, employed as an "emigration agent," was admitted on the 23rd January 1873.

The patient has been in India for seventeen years, and always enjoyed good health up to within the last three months. During this period, however, he has been suffering from repeated attacks of intermittent fever with dysentery and hepatic pain.

Thinks the pain in the liver set in about a month after the dysentery began.

Has never been addicted to excessive spirit or beer drinking. Never had syphilis.

On admission presents a very worn and emaciated appearance. Gets fever daily. The liver is enlarged, and tender on pressure. Hepatic dulness extends upwards to the seventh rib, and downwards for three fingers' breadth below the ribs. The lower part of the right side of the chest is expanded and bulging, measures from spine to ensiform cartilage (at the level of the ninth rib) *sixteen inches*, the measurement on the opposite side at the same level being *fourteen and a quarter inches*. The right lower intercostal spaces are wide. The superficial veins large and tortuous. Indistinct fluctuation is observed in that portion of the liver which lies below the ribs.

2nd day.—Bowels loose, three stools since admission, consisting of slimy fœcal matter and a little gelatinous mucus (obtained in "washing"). *Urine:* 64 ozs., specific gravity 1004, faintly acid, no albumen, no sugar, a trace of biliary coloring matter, no microscopic sediment.

Appetite fairly good. Pulse 108, temperature 101°, respiration 24.

Vespere.—Pulse 112, temperature 101°F., respiration 28.

8th day.—Has had two severe rigors. Complains to-day of "burning" at the ensiform cartilage.

The hypochondrium is more distended and bulging, and fluctuation has become distinct below the ribs; pain, however, not much increased. Pulse 110, temperature 98°4′F, respiration 32.

Liver first explored and then *tapped* with Dieulafoy's aspirator—the second sized, or No. 2, cannula and trochar being used,—at a point two and a half inches below the ensiform cartilage, and one inch to the right of the median line. *Twenty ounces* of pus were easily evacuated: the first portion was thin and reddish-brown; the last thick, fawn colored, creamy, and had a peculiar, but not offensive, odour. The bulging of the intercostal spaces immediately subsided, and clearness on percussion could be demonstrated as low as the sixth rib. The puncture was covered by a piece of cotton-wool soaked in collodion.

Vespere.—Very considerably relieved; complains of no pain except a little "burning" at the seat of puncture. Has taken food well. Pulse 108, respiration 28, temperature 98°2′F.

9th day.—Pulse 92, temperature 98°4′F., respiration 24. Complains of a dry hacking cough; can lie on both sides now comfortably.

12th day.—Had a severe rigor last night, and indistinct fluctuation is felt below the ribs. Pulse 100, temperature 100°8′F., respiration 24.

Vespere.—The prominence and distension of the hypochondrium have become greater during the day, and the patient complains of considerable pain and tenderness in this part. Respiration embarrassed, 38 per minute. Pulse 132, temperature 102°4′F.

The abscess was, therefore, again tapped with the aspirator—(No. 2 cannula and trochar used)—at a spot half an inch below the former point of puncture, and *sixteen ounces* of pus easily evacuated. The first portion was again thin claret-colored; the last, thick, reddish-brown, not fœtid in the least; slightly acid in reaction. Wound dressed as before with collodion.

Temperature at 10 P.M. (three hours after operation) 99°4′F. Bulging of hypochondrium subsided.

13*th day.*—Feels easier; only complains of a slight "pricking" pain in the liver. Pulse 108, temperature 99°4′F., respiration 26.

15*th day.*—Fluctuation has reappeared in the hepatic tumour, but this time the abscess points very directly in the ninth intercostal space. No. 1 trochar and cannula introduced at the above spot, just anterior to the angle of the ninth rib, and *eighteen ounces* of pus evacuated by the aspirator. Character of the fluid same as before. Pulse 104, temperature 99°F., respiration 32.

Vespere.—A little relieved. Complains of pain below the ribs in the hypochondrium. Pulse 112, temperature 99°4′F., respiration 34. Perspiring profusely.

18*th day.*—Fluctuation has reappeared in the lower intercostal spaces. Pulse 112, temperature 100°4′F., respiration 42.

At 10 A.M. abscess *tapped for the fourth* time with No. 2 trochar and cannula and the aspirator. Puncture made in the eighth intercostal space, midway between the angles of the (adjacent) ribs and their junction with the costal cartilages. *Eighteen* ounces of pus evacuated pretty easily. The whole of it is thinner than that removed on the former occasions, and has a specific gravity of from 1055—1060: in reaction slightly acid, free from fœtor.

Vespere.—No distension or uneasiness in the hepatic region. Has passed several scanty offensive stools. Pulse 128, temperature 101°2′F., respiration 36.

21*st day.*—Temperature 99°F., pulse 114, respiration 42. Abscess cavity has refilled, and the whole hypochondrium is again much distended and fluctuating.

At 10 A.M. *tapped for the fifth* time,—a fresh puncture being made between the ninth and tenth ribs,—and *twenty-four ounces* of pus evacuated by the aspirator. The first portion thin; the last thick, cream-like, distinctly acid in reaction. After emptying the abscess, its cavity was washed out by means of the aspirator, with a weak solution of carbolic acid.

Vespere.—Pulse 124, temperature 101°F., respiration 32.

24*th day.*—Fluctuation having again returned, a small superficial incision was made in the skin between the eighth and ninth ribs (midway between their angles and costal terminations), an *ordinary large sized trochar* was then passed into the abscess cavity, and *sixteen ounces of pus* removed. (The operation was performed under a dense spray of carbolic acid.) The first portion was thin turmeric-yellow; the last, thick, reddish-brown, and of peculiar (but not fœtid) odour. The cavity was again washed out with carbolic acid solution (1—100), and the wound dressed antiseptically. This is the *sixth operation* on the patient.

Before operation pulse 120, temperature 98°4′F., respiration 28.

Vespere (after operation).—Pulse 126, temperature 102°F., respiration 40.

28*th day.*—Has improved a little during the last three days. To-day, however, fluctuation has once more appeared in the abscess cavity. Pulse 108, temperature 97°F., respiration 36. Has passed five greenish-yellow, offensive, mucous stools.

At 10-30 A.M., operated upon for the *seventh* time.

A small superficial incision being made through the skin of the abdomen, two and a half inches below the ensiform cartilage, and an inch and a half to the right of the median line, a large sized trochar and cannula (same as used for paracentesis abdominis) was passed into the abscess cavity, and *twenty ounces*

of sero-purulent fluid evacuated. The cavity was then washed out with weak carbolic acid solution, and dressed antiseptically with several folds of paraffine-gauze. The operation, as before, was performed under carbolic spray.

12-30 P.M.—Temperature 98°2′F., pulse 136, respiration 42.

Vespere.—Pulse 128, temperature 103°F., respiration 44. No pain whatever in the liver.

32*nd day.*—No permanent benefit. Pus has reaccumulated, and the abscess cavity is again distended. It was, therefore, resolved to "drain" the abscess to-day. The same operation was performed (and at the same spot) as that above described. *Twenty-four ounces* of pus were evacuated; the abscess cavity washed out with a weak solution of carbolic acid, and then a short perforated guttapercha drainage tube inserted through the opening made by the trochar and cannula. The part was dressed as before with several layers of paraffine-gauze.

Before operation, temperature 97°F., pulse 100, respiration 24.

Vespere (*after operation*).—Temperature 99° F., pulse 114, respiration 28. Expresses himself greatly relieved.

37*th day.*—The discharge from the abscess has been very copious. Each day a fresh drainage-tube has been introduced, and the part carefully dressed antiseptically. The patient has become much exhausted, and is very feeble. Has slight bronchitis with scanty muco-purulent expectoration. Perspires profusely, especially at night.

Vespere.—Had a severe rigor at noon. Pulse 114, temperature 100°4′F., respiration 32.

38*th day.*—Very weak and low: breathing embarrassed. Has considerable difficulty in swallowing even fluid nourishment. Discharge from the abscess comes away readily, but is more scanty. Pulse 124, temperature 98°6′F., respiration 40.

Vespere.—Perspiring profusely; extremities cold. Is evidently sinking. Pulse 104, thready, small, flickering. Temperature 100°F. Respiration 24, shallow, gasping.

March 2nd (39*th day*).—Died at 3-30 A.M.

Post-mortem Examination, five and a half hours after death.—Liver enormously enlarged, and closely adherent by the greater portion of its upper surface to the diaphragm and anterior wall of the abdomen. A probe being passed into the opening in the abdominal wall, through which, during life, the abscess was drained, reaches a cavity the size of a small orange situated deeply in the substance of the right lobe, extending to within a few lines of the transverse fissure. Its walls have evidently contracted,—they are soft, puckered and ragged. It contains a small quantity of thick yellow pus, and some similarly colored serum. Immediately above this abscess cavity,—separated by a narrow boundary of tolerably healthy liver-substance, about half an inch in thickness,—is a large portion of hepatic parenchyma in a state of "yellow-softening," not absolutely fluid, but diffluent. It reaches the surface of the organ, and is the size of an orange. Closely examined, it is seen to consist of three coalesced yellow suppurative foci. Scattered through the rest of the right lobe are two or three other small patches of yellow softening, each distinctly circumscribed and surrounded by a hyperæmic zone of liver parenchyma. One of these—the size of a pigeon's egg—is situated superficially, to the extreme right of the superior border, just beneath the diaphragm.

The whole anterior half of the substance of the left lobe of the liver is converted into a large abscess with yellow sero-purulent contents.

Almost the whole of the "lobus quadratus" is in a state of yellow softening, its upper part being broken down, and communicating with the large abscess in the right lobe (above described).

The gall bladder is very anæmic, its walls greatly thickened. The bile measures half an ounce, is thin, pale-sherry colored. A distinct communication may be traced between the cystic duct and the main abscess (that which was drained during life). Very little unaffected liver substance exists in either

lobe. The organ weighs (after the escape of the greater portion of the contents of the several abscesses) 5lbs. 1oz.

The only other *post-mortem* appearance worthy of note was the condition of the *large intestine*, which, from the cœcum to the anus, presented a continuous series of foul, sloughy, dysenteric ulcers, varying in size and depth, the great majority being recent and acutely inflamed.

The *hæmorrhoidal and mesenteric veins* were all carefully dissected, but nowhere could any trace of coagulation or thrombosis be detected. The blood they contained was small in quantity and quite fluid.

The *mesenteric glands* were slightly enlarged, tumid, and softer than normal on section.

Remarks.—I have reported this case at some length, because the clinical notes at my disposal are very copious, and have been recorded with great care by Sub-Assistant Surgeon Deno Nath Mitter; the case, too, is a very important and interesting one, exhibiting as it does the effects of the various plans adopted for the evacuation of the abscess. Perhaps the most striking and *primâ facie* fact to be noted is, the great rapidity with which, time after time, the abscess refilled, so that, it must again be here observed that however useful the "aspirator" may be as a means of emptying these abscesses without the introduction of air, yet, that even when used most carefully, and when acting as perfectly as possible, it does not in any way seem to control or prevent the further formation of pus. It was from disappointment in this respect that a weak solution of carbolic acid was used, with a view, if possible, of giving a healthier tone to the rapidly disintegrating abscess-walls, but in this we did not succeed. A drainage tube was then suggested,—and tried; the discharge had free vent, was kept disinfected, and became gradually less in quantity, but, as the issue of the case proved, this method, also proved a failure. The only question is, whether the latter procedure was not adopted too late. That it *did do*

some good is evidenced, not only by the gradual lessening of the discharge, but also by the appearances presented by the drained abscess cavity on *post-mortem* examination. There could be no doubt from its conformation and outline that it had *undergone very considerable shrinking and contraction.* If, therefore, it (drainage) had been resorted to earlier, before so many secondary abscesses had formed around the original one, might not a different result have been reasonably expected? At any rate the suggestion seems obvious, *viz.*, that in cases where there is every reason for supposing that the abscess is a *large single* one, and that it refills very rapidly after aspiration, *"drainage" should at once be resorted to* as likely under these circumstances to give the patient the best chance of recovery.

The quantity of pus evacuated during life by means of the eight operations on the liver was *one hundred and fifty-six ounces*, and at a rough calculation at least *twenty ounces more* were discharged through the drainage tube during the last days of life, so that the total quantity removed would, in aggregate, amount to not less than from 175 to 180 ounces. This will give some idea of the size of the abscess and of the rapidity of suppuration in the liver.

There is apparently some reason for associating the hepatic inflammation in this case with the dysenteric lesions found in the large intestine; whether, however, this association can be regarded in the light of cause and effect (according to Budd's theory), or as a coincidence somewhat frequent in tropical countries, I must leave others to judge of. I would merely mention, that the branches of the portal vein were very carefully examined, but no coagulation or thrombosis within their walls could anywhere be detected. A chart (No. 5) of this patient's diurnal temperature is appended—see p. 75.

Case No. XIV.—Mr. A——, an European, aged 30, applied to Dr. Waller in the early part of September 1872 for medical advice, stating that he had been suffering for some time from dysentery, with pain about the rectum and anus.

The stools were examined and found to be "almost wholly composed of blood, but not dysenteric;"—the hæmorrhage probably came from conjested hæmorrhoidal vessels.

The patient kept to work until about the middle of October, when he began to complain chiefly of weakness and quotidean fever, but of no distinct hepatic symptoms. He was now obliged to take to his bed.

The liver was carefully examined daily, and on the 19th of October "a distinct swelling, a little to the right of the epigastrium, was perceived; this increased rapidly," and as an abscess was suspected, the patient was operated upon on the morning of the 22nd. The tumour was first explored and then *tapped with Dieulafoy's aspirator*—(the patient being placed under chloroform for a few minutes during the introduction of the trochar and cannula). From *nine to ten ounces* of thick hepatic pus were evacuated. The puncture was dressed antiseptically, and healed rapidly. The subsequent progress of the case may best be understood by reference to the accompanying Temperature Chart No. 7, p. 77.

Suffice to say the patient recovered without a bad symptom, and in ten days after the operation was able to resume work. The total period he was under observation for the hepatitis was sixteen days. The patient has remained well ever since.

The following table exhibits some of the most important points connected with the above fourteen cases.

No. of Case.	Nationality or Race.	Age.	History of Dysentery.	Amount of Pus evacuated by "Aspirator."	Number of "Tappings."	Days under Treatment.	Result.
I	Hindu ...	40	None ...	112 ozs.	1	20	Recovered.
II	" ...	35	" ...	60 "	2	35	"
III	" ...	45	Yes ...	40 "	2	39	"
IV	Mahommedan ...	35	None ...	41 "	3	17	Died.
V	Hindu ...	30	" ...	115 "	2	19	"
VI	East Indian ...	30	Yes ...	16 "	1	121	Recovered.
VII	Hindu ...	30	Equivocal ...	24½ "	5	107	"
VIII	" ...	45	None ...	64 "	1	4	Died.
IX	" ...	24	" ...	16 "	5	121	Recovered.
X	" ...	40	Yes ...	16 "	5	101	"
XI	European ...	39	Equivocal ...	156 "	3	12	Died.
XII	East Indian ...	40	None ...	13 "	1	9	"
XIII	European ...	35	Yes ...	156 "	8	39	"
XIV	" ...	30	None ...	10 "	1	16	Recovered.

An analysis of this table gives the following details:

1*st.*—*As regards nationality or race*, the fourteen cases were distributed among

8 Hindus,
3 Europeans,
2 East Indians, and
1 Mahomedan.

2*nd.*—*Age.*—Under 30 years ..... 1 case.
Between 30 and 40 years ... 8 cases.
Between 40 and 50 years ... 5 cases.

3*rd.*—*History of Dysentery*:
Present in 4 cases.
Absent in 8 cases.
Equivocal in 2 cases.

The reasons for denominating two cases as "equivocal" may be learnt by reference to the "histories" and "remarks" appended to the detailed account of these cases (Nos. VII and XI, pp. 27 and 44).

4*th.*—The largest amount of pus evacuated by means of the "aspirator" was 156 ozs. (Cases XI and XIII).

The largest amount removed at one operation was 112 ozs. (Case I).

The average amount per case of the fourteen is, about 59 ozs.

5*th.*—The total number of "tappings" with the aspirator is 40; and the largest number in one case 8 (Case XIII).

6*th.*—The average duration under treatment per case of the fourteen is, about 47 days.

7*th.*—Of the fourteen cases treated, eight recovered and six died, the percentage of recoveries is, therefore, 57.1.

With reference to the *pus* evacuated from these hepatic abscesses, its general characters are so well known that but little comment seems necessary. In the majority of cases it is thick, pink, or reddish-brown in color, the last drawn being more

decidedly bloody. The color and consistency resemble nothing so much perhaps as a mixture of port wine with thick boiled arrowroot. It is so tenacious that, both when fresh, and also after standing for six or eight hours, the vessel in which it has been collected may be inverted without any fear of the thicker portion being spilt.

This (typical?) hepatic pus is *always neutral* or *slightly acid* in reaction.

Often, however, even after one operation (I refer now especially to aspirations with Dieulafoy's instrument),—and almost certainly, after the second and subsequent ones, the characters of the pus change considerably. It becomes serous, thin, prune-juice-like, having a specific gravity of 1045-50 (only the last portions evacuated being thick and creamy), and the reaction is faintly or more or less decidedly *acid*. These characters sometimes belong to the fluid evacuated for the *first time* from an abscess (see Cases VIII, XI, and XIII); the latter may then be presumed to be a very large one, and the prognosis is, I think, always *bad* in such cases.

As regards *odour*, I have generally described this in the foregoing cases as absent—the "pus odourless;" this is perhaps not strictly true. What has really been meant is an *absence of fœtor*. Hepatic pus *has* an odour *sui generis;* it is fleshy, mawkish, very peculiar, and quite distinctive; and when aspirations have been performed successfully,—*i. e.*, without admission of air,—this is the condition of pus found on each occasion. Should air, however, enter, the fluid becomes sour, smells like water in which cabbage has been boiled, and is more or less distinctly fœtid. In certain cases, too, incipient decomposition, as evidenced by the odour, is present from the first, and has been noted in two or three of the cases under consideration.

Hepatic pus contains albumen and chlorides. When examined microscopically, the basis substance is seen to be highly fibrinous, coagulating spontaneously on the slide, and presenting

wavy, rod-like, interlacing hyaline stems, or branching filaments, just as the fibrin of blood does. In this basis substance are found (1) colored blood corpuscles; (2) innumerable pus-cells, some entire, many broken down and presenting angular, contorted and irregular outlines; (3) granular (or sometimes almost hyaline) large, flattened cells, with or without nuclei, facetted as it were, lying closely in juxtaposition in groups of threes or fours or more—true hepatic cells; (4) fat globules and molecules in great abundance; (5) free nuclei and granular matter; occasionally, (6) colored granules, yellow, green, and purple (biliary ?); and (7) fine delicate wavy filaments of elastic tissue.

Thermometric observations in the fourteen cases of hepatic abscess, now recorded, give such varied results, that no very general principles can be deduced from them. Associated as the majority of these cases are with the impress of periodicity in the accession of the fever paroxysms, a more or less regular quotidean, tertian, quartan, or double quartan thermometric range,—so characteristic of malarial disease,—is capable of being traced in almost all of them.

In some, however, the process of suppuration in the liver appeared to proceed without in any noteable degree disturbing the normal daily fluctuations of temperature; and in others (see especially Case XIII, Chart No. 5), a very distinctly *pyæmic* character is stamped upon the thermal variations.

Perhaps these apparently irreconcilable or discrepant results may be due to differences in the *exciting causes* of the suppurative hepatitis; such cases as the one last quoted (No. XIII), if judged of by their thermometry alone, would seem incontrovertibly to point to *septic* poisoning as the source of the morbid processes initiated and carried on in the affected organ, whilst the former class,—where a more equable range of temperature is maintained,—perhaps depend upon a more exclusively central or parenchymatous inflammation,—a hepatitis pure and simple?

No very high temperature is recorded in any of the cases we are discussing; nothing higher than 105° F. has been met with in any case, the commonest range being from 98° to 103°F.

One fact has been noticed, to which very few exceptions have occurred, namely, that *the temperature always rises after a tapping*, yet, inasmuch as this operation has, in almost every instance, been performed in the forenoon, the *evening* rise of temperature may probably in part be attributed to that intermittent character in the fever paroxysms which, from the first, is so well marked in the majority of these cases, and which, usually reaching its height after midday, requires, as a rule, a longer interval than a few hours,—and sometimes even several days,—to return or descend to normal limits.

The thermometer, however, is a valuable guide in the *prognosis* of hepatic abscess. For, whereas in cases in which reaccumulations take place, and the morbid process proceeds unchecked, the temperature only descends for a day or two after evacuation (and sometimes not at all),—in those which tend to recovery, although for a few days an abnormally high temperature may persist, yet it shows indications of a gradual fall (*lysis*), and never again rises to the height observed *prior* to the operation. This may readily be verified by comparing Charts Nos. 1, 2, 3, 4, and 5 (all fatal cases), with Nos. 6 and 7 (cases of recovery).*

In estimating the value of this method of treatment (pneumatic aspiration) as exhibited in the results now given in the

* I must here apologize for not being able to exhibit charts of the temperature in *all* the fourteen cases under consideration. In the first three cases, the records, although I believe reliable as far as they go, and as I have given them, are yet, on the whole, imperfect. Cases VII, IX, and X have temperature sheets extending over 100 days, and therefore too long for publication or even abbreviation. It has not been thought worth while giving a chart of Case VIII, as the patient was in hospital for *four days* only, and the temperature will be found fully recorded in the detailed account. The remaining seven cases have been "charted,"—five are fatal cases, and two of recovery. I trust these may serve for comparison, and help to elucidate the remarks which have been made in the text on this very interesting and important subject.

fourteen cases recorded, certain facts must be taken into consideration.

And, first, the *condition of the patients* operated upon. Almost all were debilitated, emaciated, and worn out by disease to the last degree. As a general rule, it is only in this far advanced state of exhaustion that natives apply for relief at public hospitals. The chances of recovery are, therefore, in the large majority of cases, small, and in many, almost absolutely hopeless. Notwithstanding these circumstances, the percentage of recoveries is, I believe (though speaking under correction), higher than has hitherto been obtained from any of the older methods of treatment, and presumably, yet more favorable results are to be expected in private practice, and in military hospitals, where patients are not so reluctant in applying for medical advice, and are capable of being taken in hand at an early stage of disease.

Moreover, with such an instrument as the "aspirator," a medical man may no longer remain in doubt in any given case, but can proceed at once by exploration (which is I believe *absolutely safe*) to verify or negative the diagnosis or even *suspicion* of the presence of an abscess in the liver; and if a correct diagnosis can be thus obtained early, the appropriate treatment will follow as a matter of course. The gain, therefore, to the patient is incalculable,—for it will be conceded, that with the liver as with every other organ of the body, a limited destruction of tissue is a far less serious condition than extensive disorganization and disintegration of secreting structure. Of the fourteen cases herewith recorded, those have done best under pneumatic aspiration in which the abscess has been *early diagnosed, was of moderate size* (except Case I, in which the abscess was an enormous one),—and in which the *patient has not been reduced to an excessively low degree of vitality.*

There is one other point to be taken into consideration, and that is, that in the aspirator we have as yet only an *imperfect* instrument. Several modifications have already been suggested, and it is hoped will soon be carried into effect. The fittings ("screws, taps," &c.) of the instruments hitherto received in this country have been very badly put together, and have constantly needed repair. The small piece of guttapercha tubing also, which forms an important part of the present instrument, is most inconvenient; it soon wears out and becomes unserviceable, and must be discarded, if possible.* Two *modifications* of Dieulafoy's Aspirator have been manufactured and patented by Weiss. In one, the cylinder is of brass, but the fittings are untrustworthy. The other instrument will, probably, never come into general use in this country, for, instead of only a small piece of guttapercha tubing (in itself so objectionable), several yards of this material form part of the latter apparatus, which may roughly be described as consisting of a brass exhausting syringe at one end, a glass bottle in the centre, into which the pus flows by aspiration, and the usual needles at the other end, long pieces of tubing connecting these parts.

It must be confessed that the results hitherto obtained in the treatment of hepatic abscess by pneumatic aspiration, although *comparatively good*, have been *disappointing*, and have not fulfilled the particularly hopeful expectations at first entertained.† Still, no very decided opinion can, at present, be expressed, as the number of cases in which this method of treatment has been adopted appears to be too small to permit of any absolutely trustworthy conclusion being drawn on this subject.

* No tubing of this kind seems capable of resisting an Indian climate; it readily splits, and is then worthless.

† I may here mention that four cases of hepatic abscess treated by pneumatic aspiration are recorded in the *Madras Monthly Journal of Medical Science* for February 1871. In all four, the operations gave considerable relief; two patients, however, died—one a European, the other a native (in both cases the abscesses were very large). The third case, a Mussulman, "derived immediate and marked benefit" from the use of the aspirator, and after coughing up the remains of this or another abscess through the lung, recovered; and the fourth patient, a European, after having been tapped twice, was "in a very precarious state" owing to the consolidation of one lung, but the ultimate result is not given.

My object in publishing these cases has not been so much to advocate pneumatic aspiration in hepatic abscess, as simply to place on record the results which have been obtained by the adoption of this plan of treatment in a large public hospital.

Most practitioners in this country are, it is to be presumed, of one opinion now as to the *advisability*, and even *necessity*, of operating on all such cases, and not trusting to the possible evacuation of the abscess through vicarious channels, unless these appear already to have been established.

If this be granted, obviously the next most important question is—what is the best method of operative interference?

Speaking from the limited personal experience hitherto gained, I have no hesitation in recommending pneumatic aspiration as the safest and most reliable means of evacuating these abscesses when *small;* when *large*, or when *reaccumulations take place rapidly*, I believe free "drainage," with careful antiseptic dressing of the part, will give the patient the best chance of recovery.

The subject of the treatment of *hepatic abscess* by pneumatic aspiration has alone been discussed in the forgoing pages, but as an appendix or conclusion to this paper, perhaps a few observations as to the adaptability and uses of the aspirator in other more common morbid conditions, may not prove uninteresting.

I have notes of three cases of *retention of urine*, in which this instrument was employed with great benefit in this hospital. They may be related thus briefly:

(1). A young Bengali, who for some years had suffered from a gleet, was admitted with a distended bladder, and in great pain from the total inability to void his urine. No instrument could be passed into the bladder, and the symptoms being very urgent, (the late) Dr. Collis punctured the viscus above the pubis, using No. 2 trochar and cannula. By means of the aspirator *twenty-two ounces* of urine were drawn off. The patient was immediately relieved; and afterwards passed water in a thin stream

himself. Subsequently, the urethra was dilated by Holt's instrument, and the patient discharged "cured" on the eleventh day.

(2). Another young sickly-looking Bengali was admitted under Dr. Collis with an abscess in the hypogastric region, *simulating a distended bladder*. There was no actual retention of urine, but difficulty and straining in the attempts to pass water, and no instrument could be introduced into the bladder. The abscess was, therefore, tapped with the aspirator,—No. 2 trochar and cannula being used,—and about *four ounces* of thin pus drawn off, to the immediate relief of the patient. The urine could now be passed freely, and the patient made a rapid recovery. The abscess had evidently pressed upon the neck of the bladder, and thus caused the difficulty in micturition.

(3). An East Indian sustained a fracture of the spine in the dorsal region, and was admitted in a state of paraplegia. On attempting to draw off the urine from his bladder, it was found that he had a very tight organic stricture, through which no instrument could be made to pass. Paracentesis of the bladder above the pubes was, therefore, performed (by the late Dr. Collis), and *twenty-eight ounces* of urine evacuated by the aspirator. In this way he was tapped six times successively, after which No. 2 catheter could be introduced, and the aspirator was no longer required.

This patient ultimately died of pleuro-pneumonia on the 17th day after admission.

The attention of Surgeons in Europe has recently been directed to the value and safety of puncture of the strangulated bowel in cases of *hernia*, where taxis has been employed unsuccessfully.

Dr. Léon Labbé of the Hôpital La Pitié has somewhat lately published a case of strangulated inguinal hernia, treated by puncture of the bowel and evacuation of its contents by the

"aspirator." The strangulation was of eighteen hours' duration, in an old man, aged 70. Taxis had failed, and aspiration was, therefore, suggested. The hernia was punctured with No. 2 needle, and two drachms and a half of a yellowish liquid and a quantity of gas escaped. The tumour, which was "as large as the fist," immediately collapsed, and was then reduced without difficulty. The patient recovered in eight days.*

Another case was brought before the Académie de Médecine on May the 21st, 1872, by M. Dumarquay. "In this instance, after taxis had failed, a fine trochar was passed into the centre of the tumour, which was a strangulated congenital inguinal hernia, and by means of the "aspirator" about 120 grammes of intestinal liquid was drawn off into the recipient. No ill consequences followed, and the patient rapidly got well."†

Mr. Bryant, of Guy's Hospital, also, very strongly advocates the puncture of the gut in certain cases of "large strangulated scrotal herniæ, strangulated umbilical herniæ, and in all cases of acute internal strangulation due possibly to bands or twists."‡

Mr. Bryant appears hitherto to have used the "grooved needle" for this purpose, but the aspirator evidently would be the most convenient and appropriate instrument in such cases.

The importance to surgical practice of the introduction of any plan for the treatment of such grave accidents as those which have been above alluded to, need not be dilated upon. The possibility of relieving a strangulated hernia without having recourse to the usual operation, is an innovation which must recommend itself to every conservative surgeon.

It will be seen, therefore, from the instances which have now been brought forward (and which might be multiplied), that the adaptability of the "aspirator" is by no means confined to the

* See *Lancet*, July 20th, 1872, p. 78.

† *Medical Times and Gazette*, August 3rd, 1872, p. 120.

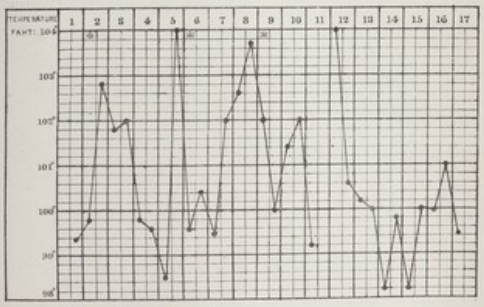
‡ *Id.*, April 20th, 1872, p. 455.

cases in connection with which its employment, in this paper, has been chiefly discussed.

Although, undoubtedly, there is room for many improvements in the construction of the instrument, yet, even in its present condition, it is almost *perfect* for *diagnostic purposes*, and if this were its only recommendation, it would be a very great one, and fully entitles the "aspirator" to a place by the side of our stethoscopes, ophthalmoscopes, and other *armes de précision*.

CALCUTTA, *May* 1873.

CHART No. 1. *Days of observation.* CASE No. IV.



* Indicates day of operation.

CHART No. 2. *Days of observation.* CASE No. V.

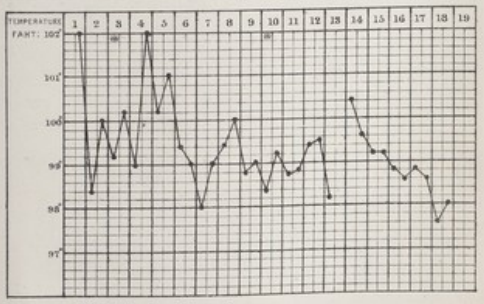


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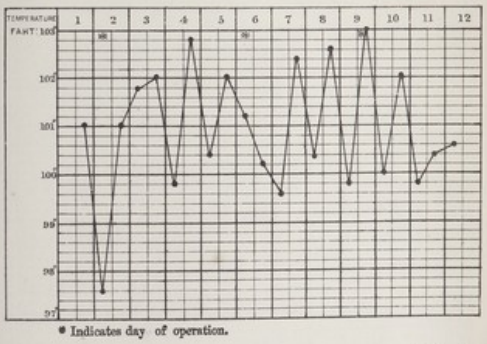
CHART No. 3. *Days of observation.* CASE No. XI.



* Indicates day of operation.

CHART No. 4. *Days of observation.* CASE No. XII

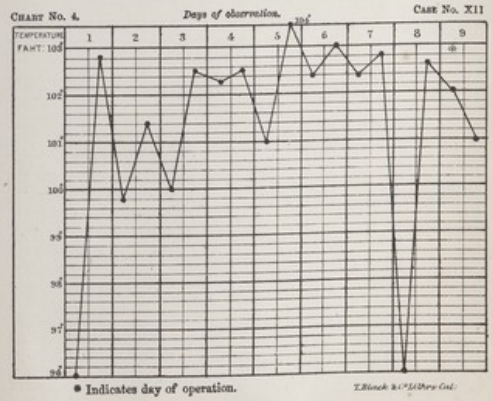


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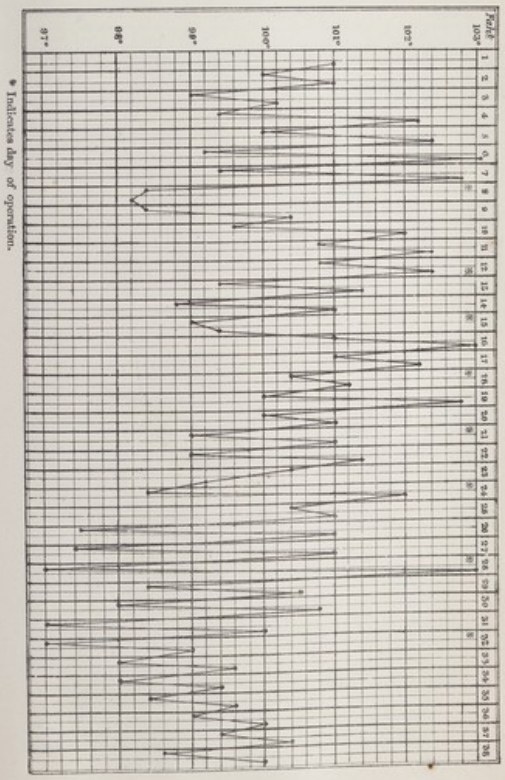
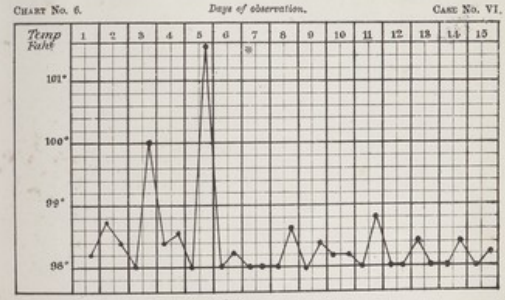
CHART No. 5. Case No. XIII.



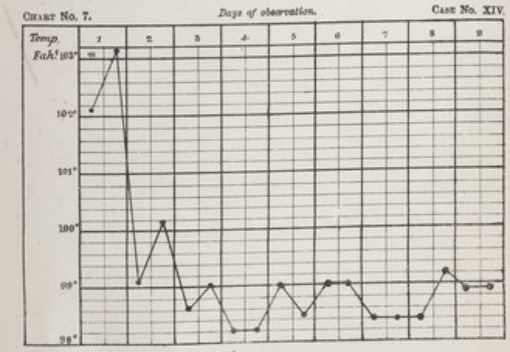
* Indicates day of operation.

CHART No. 6. *Days of observation.* CASE No. VI.



* Indicates day of operation.

CHART No. 7. *Days of observation.* CASE No. XIV.



* Indicates day of operation.

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PAMPHLETS

71

71