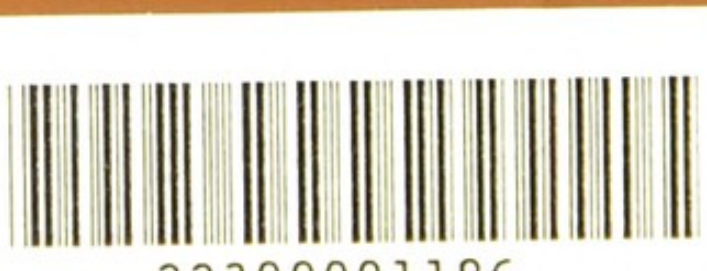
Notes on the origin, nature, prevention, and treatment of Asiatic cholera / by John C. Peters.

NOTES ON

ASIATIC CHOLERA.

PETERS.



NOTICES OF THE PRESS.

(*From the Chicago Medical Journal, Oct.*, 1866.)

"We have read this monograph with much pleasure. An agreeable style does wonders for a dull subject. For the first time we have been interested by the chapter which forms the dreary introduction to all other books on cholera—the chapter which is devoted to the history of the origin of the disease. Thanks to Dr. Peters, we have waded through the filth of Bigginugar, Ramieseveram, of Jessore, Mysore, Conjeiveram, and the feast of Kuibar Bariam without losing all stomach for the remainder of the book. This we consider a victory of no small importance to the author. The chapter on the course and distribution of cholera presents an array of facts and arguments in proof of the portability and communicability of the germs of cholera which may be considered as decisive. It will be difficult for any one hereafter to entertain the miasmatic or atmospheric wave theory of the causation of the disease. It appears certain that the victim of cholera throws off, probably through the medium of the intestinal dejections, innumerable germs which are transported in a manner analogous to the distribution of the seeds of plants. The causes which favor the germination and reproduction of the one class of germs, are strictly analogous to those favorable to the growth of the other. *The experience of our own community during the present visitation of cholera, fully illustrates this proposition.* Warmth, moisture, filth, and physical

predisposition afford the soil upon which cholera flourishes and spreads. When these elements are withdrawn the prevalence of the disease is reduced to a minimum, and it becomes extinct, precisely as the seed of the sower springs not up when cast upon the dry and stony rock.

"The section on treatment is little more than a catalogue of the various remedies which have been used by all classes of doctors—homœopathic included. Having enjoyed peculiar advantages for the observation of every variety of treatment—the homœopathic included—the author is enabled to speak with authority. Dr. Peters gives the preference to iron-alum, and sulphate of iron. The book is beautifully printed on tinted paper, and forms a work which does credit to all who have been concerned in its production."

(*From the Boston Medical and Surgical Journal, Nov.* 8, 1866.)

"Cholera is discussed in this the last, and perhaps the best, of the many volumes published this year upon this subject.

"The reader will find this volume very interesting throughout, and *the chapter on treatment is particularly instructive.*"

"The opinions which Dr. Peters adopts are not different from those maintained by many experienced physicians of the times; but it is safe to say that no book which has been published in this country, and so far as we know in Europe, contains either so complete a history of cholera, or so thorough an analysis of its manifestations in all parts of the world. To professional men it cannot but be of the highest value; while to the general public a careful reading of a sensible work like this must be benefi-

cial. It is a small volume and should be widely circulated."—*Boston Journal.*

"We suppose that we are warranted in congratulating the public on its escape from cholera—for the present. But it is a long-lived, a persevering, and a pertinacious scourge. It may have spared us only for a season—or for this season. Another year may find it less favorably disposed toward us, for it is as capricious as it is persistent in its course and operations; and therefore it behooves us to obtain as much and as accurate knowledge of it as we can acquire. Dr. Peters's treatise is the best which has fallen under our notice. In a comparatively small compass he has massed all the facts that bear upon the nature, origin, progress, and history of the disease. How much has been done, and how it has been done, and what should be done to reduce cholera to a tame disease, can be learnt from the calm but strong pages of this treatise, which has quite exhausted the subject. A more invigorating book it would not be possible to name, for its arguments and statements remove fear by the process of actual demonstration; and fear is cholera's chief feeder. Dr. Peters's treatise deserves the most extensive circulation, and means should be taken to make it universally known,"—*Boston Post.*

(*From the St. Louis Medical and Surgical Journal, September and October*, 1866.)

"Dr. Peters's work is one of the best on our list, for its material has been collected with diligence and care. Much space is devoted to the origin and mode of distribution; while the theory of its portability by persons, ships, clothing, and baggage, and

by water, dust, etc., is fully carried out. *The chapter on the prevention of cholera, and that on the management of patients and nurses, are the most commendable;* they are very correct and efficient in our opinion. The materia medica of cholera is very complete, and therefore very useful to any one desirous of studying the resources of the physician against this dire disease. The length of our notice bears testimony that we have not found it void of worth and useful information.

"It remains to pay our tribute to the publisher, who has left us nothing to criticise in the appearance of the book. Its clear type and general neatness make us express a warm desire to see Mr. Van Nostrand engage more extensively in medical publication."

"Dr. Peters, as is usual with him, claims but little more than the credit of a compiler, which we think is much less than his due, for we have met with more original matter in his book than in many works of greater pretension. We agree with the reviewer of a former work of Dr. Peters, that if the value of a work may be in some sort predicated by the modesty of an author who would make no claim for himself, nor challenge our profound regard by a flourish of trumpets—and it is not often a bad index—we are in duty bound to award him the full benefit of that short but admirable commendation of Horace:

"'Non fumum exfulgere, sed ex fumo dare lucem.'

"This man gives us not smoke from flames, but from smoke produces splendor! The internal evidence of the work proves it to be valuable to the oldest and most experienced physician. Indeed, it is a most valuable compendium of practical information selected from the very best authorities. Such a compila-

tion affords the best evidence that its author possesses much more than a theoretical acquaintance with his subject. It is the work of a practical man who understands what practical men require."

"Dr. Peters discusses the origin, nature, prevention, and treatment of cholera in a thorough and systematic manner. He establishes many facts in reference to the cause of the disease and the means by which it is transported and communicated. In his plan of treatment *he is decided*, although he recites many other and varied methods of treatment, and endeavors to estimate them at their true value. The book is an interesting one, and will be of much use to the general public by the information which it contains as to the means of guarding against cholera."

(*From the New York Journal of Medicine, Nov.*, 1866.)

Dr. Peters's treatise is an exquisite specimen of type, paper, and binding. It is an unpretending little volume, condensing within moderate limits and in a very readable way the current cholera literature, and those who have neither time nor inclination to consult the originals will find in this work a very reliable digest. The views of the author with regard to the propagation of cholera are substantially endorsed in the report of the Cholera Commission at its recent session at Constantinople. The influence of clothing and articles in common use in the transmission of cholera is strongly stated by the author, though here again he is backed by the Commission. We agree with Dr. Peters in attaching much importance to the infection of drinking water by the choleraic evacuations as at least a precipitating cause. The

work is excellent in its way and creditable to all concerned in its production.

"We are particularly impressed with the catholicity and candor of this, the more noteworthy as not being common in medical literature. Dr. Peters's physiological theory seems more sound than any that has yet been brought forward."

"We have read this book with very great pleasure. As one reads on, its interest and power takes away all thought of words except as a vehicle of thought, and produces an absorbing interest which is rarely felt, especially in a medical book. It and Baker's work on the Nile have been the most striking recent instances of the power of mind—intent upon one object, and itself seeing that clearly—to infuse the same spirit into the reader."

"This volume bears witness to faithful and careful observation on the part of its author. Industry, accuracy, and an almost marvellous prevision of the nature and course of this dire disease, are evidenced in every part of it. His statements of the possible prevention of the disease as an epidemic by hygienic and sanitary municipal regulations have been happily verified by this season's experience in New York, as contrasted with the far greater mortality from cholera in smaller cities in the central portion of the country, especially Cincinnati, Chicago, St. Louis, Nashville, etc., to which it was doubtless conveyed from New York."

NOTICES OF THE PRESS ON THE SECOND EDITION, 1867.

Philadelphia Medical and Surgical Reporter, July, 1867.

The first edition of this work was received with so much favor by the profession that we need but advert to the improvements that have been added, which give additional value to the original book.

Cincinnati Lancet and Observer, August, 1867.

This is the second edition of a very good book—all the advances in our knowledge about Cholera since the issue of the first edition are embodied in the present.

New York Medical Journal, August, 1867.

The additions to this edition materially increase its value, and make it one of the best of the numerous compends on this subject.

Western Journal of Medicine, July, 1867.

This is probably the best of the many recent monographs on Cholera, and will prove a most valuable and acceptable volume to every physician. Great credit is due to the publisher for the attractive form in which it is presented.

Army and Navy Journal, July, 1867.

This work contains a complete history of Cholera, its origin, prevention, and treatment. To professional and army and navy men it cannot but be of the highest value, while to the general public, a careful reading of a sensible work like this must be beneficial; for to know a disease is to rob it of half its terrors, and no one can read this interesting book and plead ignorance of its subject. A more invigorating book it would not be possible to name, for it removes fear by the process of actual demonstration.

Chicago Medical Journal, August, 1867.

This book was noticed at length in the October number of last year. We are pleased to find that it has been so well appreciated by the profession.

This book is confidently recommended to those physicians who are desirous of obtaining a view of the whole ground, without spending half their income for books, and a still larger proportion of their time.

The War Department of the United States has ordered a copy of this book for every military post in the country.

NOTICES OF THE PRESS ON THE SECOND EDITION, 1867.

From the Leavenworth Medical Herald, for September, 1857.

We have read this book carefully, and do not hesitate to say that it is the very best new treatise upon the subject which has yet come under our observation. The author has told a plain, unvarnished tale, in language which is at once marked by perspicuousness and strength. The style throughout is utterly devoid of diffuseness, and the salient points of the subject are massed in the most compact manner. It is this feature of the book which so completely relieves the dry parts, and holds the attention with the greatest fixedness.

The work opens with a succinct but graphic account of the ORIGIN of Cholera, which, instead of being dull and wearying, as in most treatises, is lively and interesting.

The second chapter is devoted to the narration of the COURSE AND DISTRIBUTION OF CHOLERA, and will be read with the greatest interest, not only because it is a pen-tracing of its *lines* of travel over the world, but because it expresses forcibly and *truthfully* the *means* by which it travels. An immense mass of facts are stated, so apposite in their various relationships, as to leave no doubt of the inevitable conclusion to which they point, viz., the existence of a specific agent, which is the cause of Cholera, and without which it cannot exist. The closing pages of this chapter are devoted to rebutting the arguments against its specific or infectious nature. This the author does with much sagacity and exhibition of professional knowledge, and *succeeds as well as most men do who have the great rock of truth to stand upon.*

In the chapter on PREVENTION are stated the last and most fully-recognized principles concerning disinfection. This alone is worth far more than the price of the book.

In the Appendix the nature, pathology, conveyance, and treatment of the disease are again gone over, and written up to correspond with the most recent developments.

This hasty review gives a mere outline of the work, and in no wise does it justice, and we advise all who desire to be posted up about Cholera to buy this little manual and study its pages with care.

Buffalo Medical and Surgical Journal, September, 1867.

Among the numerous manuals published of late upon Asiatic Cholera, this work especially commends itself for the thorough and systematic manner in which the Origin, Nature, Prevention, and Treatment of Cholera is discussed.

New York Medical Times, September, 1867.

In the monograph before us, Dr. Peters has compiled a mass of facts which cannot fail to interest the reader, for they are presented with considerable directness and simplicity of style. As an aggregation of facts, it is worthy of attention, and as a compendium it is trustworthy and valuable. We have no faith in false theories or hypotheses, however plausible and ingenious; but a *true* theory is a legitimate deduction from facts, not contradicted by equally numerous and equally well-substantiated facts; hence the CHAPTER ON THEORIES is not the least interesting portion of this book, which we heartily recommend, as an exceedingly meritorious production. In short, it is a modest, unpretending, and valuable compendium of trustworthy and useful information, alike creditable to author and publisher.

New York Medical Record, September 16, 1867.

This excellent and very readable book of Dr. Peters has advanced to a second edition, and we are pleased to notice the fact as an evidence of the appreciation with which the profession regards the labors of the author. Our readers are already acquainted with the intrinsic merits of this *brochure*, and we again take occasion to commend it to their careful perusal and study, *as a work singularly complete* in all those facts pertaining to Cholera which the most recent investigations of the ablest minds in the profession have given us.

This is a very interesting and instructive book. Dr. Peters has certainly produced the best minor treatise on Cholera which we ever read. It is eminently practical, and can lead no one astray from the correct principles of Theory and Practice. Although we do not agree with the author in all his opinions, this does not prevent our recognizing the excellent qualities of his treatise.—NATION.

Dr. Peters has given the ablest and most exhaustive disquisition on Asiatic Cholera yet published. Upon an industrious compilation and comparison of the views of previous and contemporary authorities, combined with extensive and accurate observation of the malady itself, he bases *many valuable original suggestions* in regard to its pathology and treatment. It may be read with pleasure and much profit.

NOTES

ON THE

ORIGIN, NATURE, PREVENTION, AND TREATMENT

OF

ASIATIC CHOLERA.

By JOHN C. PETERS, M. D.

SECOND EDITION, WITH AN APPENDIX.

New York:
D. VAN NOSTRAND, 192 BROADWAY.
1867.

PREFACE.

I HAVE been present as a practising physician in New York during the whole of the epidemics of 1849, '54, and '66; and have as distinct a recollection of that of 1832 as a boy thirteen years of age, at the time, could have.

I have seen no more of true Asiatic cholera, outside of hospitals, than usually falls to the lot one whose residence and practice are in the cleanest portions of this city. But I have visited cholera hospitals in 1849, '54, and '66, and have witnessed every variety of treatment, including the homœopathic, both of the high and low dilution, of the strict and liberal kind. The lowest average loss in asylums, like the Protestant Half-Orphan, of this city, and in homœopathic hospitals for the reception of the better classes of the poor, like that of the Sisters of Charity in Vienna, is from twenty-five to thirty-five per cent. In hospitals where the poorer and most depressed classes, and the almost dead and dying, are received, as well as those in the more or less advanced stages of the disease, as in Tessier's homœopathic wards in the Hospital St. Marguerite, in Paris, and in those of Chargés, at Marseilles, the mortality varies from fifty to seventy per cent. These estimates apply ex-

clusively to cases of true Asiatic cholera, and do not include any of cholera morbus, bilious or septic cholera, or that great majority of diarrhœas which are misnamed cholerine. The examples of actual Asiatic cholera among the middle and better classes are so few, and the slighter similarities are so numerous, that they can hardly be taken into account. Yet all these are counted in, "in cholera times," by almost all irregular practitioners, like the eclectics, hydropathists, &c.

No indulgence is asked for any statements or arguments which have been advanced, but I do request a kindly criticism of the literary portion of this treatise; for the greater portion of it has been written before 8 A. M. and after 10 P. M. There has been no leisure time to revise the first rough notes, and three fourths of the materials collected have been necessarily omitted.

There has been neither opportunity nor inclination to hurry the completion of this little treatise, in order to profit by the excitement of the times; but its necessary delay has favored a careful watch over the present epidemic, and it is confidently supposed that no facts decidedly in opposition to those on which it is based have been developed this season.

The opinions which are here advocated and adopted, are those maintained by the most experienced and scientific physicians of the times:

1st. That Asiatic cholera is both portable and communicable.

2d. It is generally carried about by persons, ships, clothing, and baggage.

3d. It never affects the entire atmosphere of any one country, district, town, or village, and rarely that of the whole of one hospital, ship, or house; but only those parts of them into which it is directly imported.

4th. That the quality of infectiousness belongs peculiarly, if not exclusively, to the matters which the cholera patient discharges by vomiting and purging.

5th. That cholera discharges, if cast away without previous disinfection, impart their own infective quality to the excremental matters, or any more innocent filth with which they mingle in drains or cesspools, and wherever else they flow or soak, and to the gases and effluvia which these substances evolve; thus poisoning the air and subsoil water.

6th. That no amount of filth, imprudence, or diarrhœal disease, without the addition of this peculiar cause, will give rise to true Asiatic cholera in temperate climates.

7th. That if the cholera poison, by leakage or soakage from drains or cesspools, or otherwise, gets access, even in small quantity, to wells or other sources of drinking water, it will infect, in the most dangerous manner, very large volumes of this fluid.

8th. That the cholera poison affects, with equal virulence, everything in the nature of bedding, clothing, towels, and the like, so that the soiled linen of a single house in

which there is a cholera patient may spread the disease over a whole district.

9th. That there is scarcely any limit to the extent to which even a single case of cholera or cholerine may infect a whole neighborhood.

10th. The counteracting and remedial agencies are simple and efficient. Whenever the disease has manifested itself, even in its slightest form, thorough disinfection must be enforced. With this single precaution no epidemic gives less excuse for any unmanly or excessive fear, since none seems to involve less of danger to those around.

11th. As cholera only affects the air of certain localities, there is not the slightest necessity for any of those general departures from the ordinary mode of life and diet which were formerly recommended. The golden rule is to live temperately, naturally, and well.

12th. Finally, no case of diarrhœa, cholera morbus, or dysentery, can be converted into cholera unless the patient has also been exposed to the peculiar infection of this disease.

In conclusion I put in no claim for great originality in any portion of this work, except for the development of the Physiological Theory, and the advocacy of the internal disinfectant and corrective treatment.

SECOND PREFACE.

It is a source of great gratification to me that every chapter of the first issue has been selected by some different reviewer for special commendation; and it is hoped that all essential deficiencies are now supplied in the Appendix.

The true nature of the cholera poison has, in all likelihood, been discovered during the past year. (See page 163.)

The prevention of cholera is already so well understood, that the disease must, sooner or later, become extinct; and it is not improbable that Europe and America have already experienced its last epidemic visitation. (See page 179.)

The distribution of cholera by drinking water, and the conveyance of the disease around the world by means of ships, persons, and clothing, may be considered positively proven. (See pages 168 and 171.)

In the first issue all other pathological appearances were intentionally omitted, except those of the intestinal

villi and glands, for the express purpose of directing special attention to them. (See pages 83, 84, and 183.)

As the object of the prescriptions given on pages 111 to 119 was to meet, not only cholera, but most of the allied diseases which occur in the Summer season and in cholera times, they will not be found too numerous, nor the selection difficult for any one who has a passable knowledge of these diseases and their remedies.

The opinions of Drs. Budd, Petenkofer, Niemeyer and others, given on pages 5 and 6, which it seems were formularized by Dr. Simon, require no alteration.

I have received much assistance in the composition of this work from Dr. F. G. Snelling, of New York, to whom my best thanks are due.

ASIATIC CHOLERA.

1. ORIGIN.

ORDINARY country, or Indian cholera, has been endemic in the delta or marsh region of the Ganges for centuries. But formerly it was a disorder peculiar to the natives, mainly induced by their mean habitations, filthy habits, and poor food; and so rare among the better fed, clothed, and housed foreign residents, that neither of the physicians who had been connected, one for five and the other for ten years, with the General Hospital of the Bengal Presidency for Europeans, had seen a single case of the disorder previously to the outbreak of the great epidemic of 1817. At Jessore, in 1817, it underwent certain unknown changes, so as to become in many respects a new disease; it then, for the first time, became epidemic and pestilential, portable and doubtless contagious; and also first broke loose from its usual confines, and commenced that fearful march of seventeen years' duration, which did not cease until it had encircled the globe. The great peculiarity of that dread march was that, although it reached China to the eastward, it did not, and has never since crossed the Pacific ocean; its westward course was slow and interrupted, but upon the whole continuous, so that it reached Moscow, Hamburg, England, and America, in about fifteen years. The second epidemic

required five or six years to traverse the same space, and that of 1865, only six months. This difference of speed in the progression of the various epidemics is most easily explained by the increased facilities and rate of travel which have followed the extension of steamboat and railroad enterprises. After 1817, the disease was called epidemic or Asiatic cholera, although twice previously to this date, it had prevailed to such an extent in the town of Jessore and its immediate neighborhood, as to render it necessary to shut the courts of justice, and suspend all business for a time.

Dr. Barnes, resident at Jessore for many years, had medical charge of the district, from 1810 till 1823; he had been familiar with the ordinary Indian cholera, during all that time, and considered it a disease peculiar to that section of the country, and one which had superseded *the periodical remittent fever*, formerly so prevalent in that district. He says, the sources of this disease could not be mistaken, although they were too extensive to be brought under human control. *Putrid exhalations* from the constant and rapid decomposition of animal and vegetable matter, and the use of *unwholesome water*, were the sole causes.

But the extent and fatality of its attack depended altogether upon the season, or seasons; for there were two in which cholera was apt to prevail:

1st. If those violent storms of thunder, lightning, wind, and rain, which annually occur in Bengal, and are known by the name of northwesters, commenced early in March, and recurred at short intervals, until the rainy season began, then the *hot* season as it is called, viz., April, May, and June, was comparatively healthy, and *vice versa*. It is during this first period that the disease is apt to spread to other countries;

for it gathers strength during the hot season, and is carried on by travellers and pilgrims.

2d. If the annual rains did not terminate till the end of September, and the floods subsided gradually during the month of October, the autumn season would be free from sickness; but, if the rains ceased at the end of August, and the waters sank rapidly during September, then the pestilence commenced at the beginning of October and raged till the middle of December, when it soon became apparently extinct. The weather, in 1816 and 1817, rendered the atmosphere peculiarly favorable for the development of cholera, its extension beyond its usual limits, and even for its generation throughout those parts of Bengal, where the materials necessary for its production existed in a less extensive degree than at Jessore. Instead of the usual rainy and dry seasons, there was scarcely a week during the whole twelve months from January to December, 1816, without rain. The sun was constantly obscured; the atmosphere close, heavy and moist; while the thermometer never ranged below seventy to seventy-five degrees from March to November. "In such a climate as this," says Barnes, "any person acquainted with the materials that accumulate in Indian towns and villages, and with the crowded, filthy, and ill-ventilated state of the houses and streets must be satisfied that these, of all others, are the conditions most favorable for contagion. The huts of the natives are nearly surrounded with pits, the earth from which is used to raise mounds on which their habitations are erected. These trenches are the receptacles for every kind of nastiness, as well as stagnant water, and the exhalations from them are at times almost insufferable." From July to October

the atmosphere of Bengal usually resembles that of a filthy vapor-bath, producing a sensation of indescribable fatigue and oppression, and an exhausting perspiration.

Jessore is a thickly-populated town, one hundred miles northeast of Calcutta, on a flat, reedy bank of the Ganges, but slightly elevated above the sea level; during the rainy season the neighborhood of the place is changed into a fetid swamp, covered with rank vegetation. By the side of this sluggish water, stood the bazaar and long rows of low, mean huts, surrounded by trees, which afforded shade, but prevented the rapid escape of moisture. The river was the receptacle for excrementitious matter, and the remains of partly burned corpses were also thrown into it, in accordance with religious superstition; and this filthy water was often used for drinking. In addition to these extremely insalubrious conditions, the first rice harvest turned out badly, for there are two rice crops in India yearly; the first occurs in August, and is always more or less unwholesome, like very fresh hay; sometimes it even produces a fatal disease, morbus oryzaeus, marked by vomiting and diarrhœa. It is also asserted that an unusual quantity of spoiled fish was eaten that year, the season being very unfavorable for its proper curing. Most violent attacks of vomiting, purging, and cramps, simulating cholera, have sometimes been traced in India to eating bad shell-fish.

Some of these exciting causes of cholera prevail over other portions of Bengal, besides in the neighborhood of Jessore. 1st. During the rainy season, viz., from June to October, from fifty to eighty inches of water falls, and the surface of the Ganges rises until the lower part of Bengal is inundated for a breadth of one hundred miles;

the river itself becomes two miles wide during the wet season, while it is only half that width during the dry time. Still, the same happens with the Nile, without similar pestilential consequences. 2d. On the great plains where lie the principal cities, and where the bulk of the natives dwell, the heat, during the greater part of the year is excessive; the thermometer often ranging from one hundred to one hundred and ten degrees. 3d. The population of Hindostan is very great, amounting to one hundred and seventy-two millions, nearly ten years ago; and it has at least thirty cities with over one hundred thousand inhabitants. 4th. In India, the religious prejudices of the people not only prevent them from using the cattle-droppings as manure, but they consider them holy and preserve them for religious purposes. There is especially the utmost recklessness as to the disposal of all descriptions of offal, and more particularly of the dejections from the human intestine. Montgomery says: "The people are naturally devoid of habits of cleanliness, and almost of decency; if allowed, they will not only resort to the public thoroughfares for the purposes of nature, but will construct cloacæ under the rooms in which they live, cook, and sleep." In short, the filth of the native villages requires to be seen to be believed in; and the streets of all the cities are narrow, dirty, and ill-paved. 5th. The rivers and streams are made the common sewers and cemeteries of the towns, while the great reservoirs or tanks of water, which are the chief public works in Hindostan of native construction, supply a more or less stagnant fluid, which is largely defiled by the careless habits of the people. 6th. The frequent accumulation of hundreds of thousands of persons together during their great

religious pilgrimages and public fairs, with all the attendant filth, misery, fatigue, exposure, and bad food. 7th. Every *camping-ground*, or place of night's-rest of the pilgrims, not only becomes saturated with filth, but remains for days, weeks, or months, a depot of "cholera-dirt" for those who subsequently linger on those contaminated places, or pass very near them. 8th. The people eat very little meat, and subsist mainly on rice.

Almost all these causes prevail in China, except the carelessness about human ordure, and the frequent aggregation of immense multitudes of unclean men, such as occur in the pilgrimages and fairs, which are almost peculiar to the Hindostanee and Mohammedan races; yet cholera does not originate in China, as far as has yet been ascertained. China has a population of over four hundred millions, and hence is more overcrowded than Bengal; it has cities with millions of inhabitants, instead of a few hundred thousands as in Hindostan; but all refuse applicable to the purpose of manuring the soil is carefully collected and delivered to the farmers, viz., human ordure, ashes, muck, gypsum, offal, hair, even human hair clipped by the barbers, is saved with all other matters which can invigorate the ground. Personal cleanliness is not among the virtues of the Chinese any more than among the Hindoos; they do not change their under-clothes till they are worn out; their houses are poorly ventilated and lighted; many of their streets are crooked and narrow, few of them exceeding ten or twelve feet in width, while most of those in the city of Canton are less then eight; but although offal and manure are not allowed to decompose in the street, there is a constant stench perceptible arising from the continual passage of the loaded scavenger's carts through

the city. Still, we repeat, in spite of all this, cholera does not *originate* in China, where religious pilgrimages are also not so frequent, nor of such gigantic proportions as in India.

We will now turn our attention to the effect of pilgrimages in the production of cholera in India.

As early as 1858, Dr. Nardoo, of the Madras medical establishment, drew attention to the causes which give rise to cholera among the pilgrims to Juggernaut. He states that the food of the devotees is prepared exclusively by the priests, in the temples; this stuff is acrid, oily, and often putrid; and the drink sour. The pilgrims arrive at their tabernacles after undergoing every fatigue on their toilsome marches, half starved, and much exhausted, and are conducted to small and badly-ventilated rooms for the accommodation of twenty to thirty persons each; they wash themselves in foul pools or tanks, and visit the image with their wet clothes still upon them; eat a variety of bad food with eagerness, taking no notice of its condition, taste, or quality, under a deeply-impressed idea that such observation would be an act of blasphemy; drink a jumbo full of very sour, rancid *tyre* and feel themselves refreshed and very much satisfied, for the first twenty-four hours. But on the second or third day the causes of diarrhœa and cholera, viz., sudden transition from heat to cold, aliment of indigestible character, acrid, oily and putrid food, acid drinks, and want of free ventilation and drainage, soon begin their operation.

The streets and houses quickly become impregnated with noxious exhalations emanating from the decomposition of the excrementitious and urinous deposits with which the streets and alleys, fields, and plains, are loaded during the assemblage of people in such great numbers, as well as from the dead

bodies thrown out in the fields and towns without sepulchre. Diarrhœa and cholera having thus originated, great alarm and despair are produced among the pilgrims; fright and despondency on the one hand, and their longings for home, relations, and friends, on the other, act conjointly as depressing agents, rendering their systems more favorable to the action of disease. Dr. Nardoo says the ravages made by this disorder are annually very lamentable; and that it is most pitiable to observe the dreadful scenes at Juggernaut, resulting from deaths in such vast numbers.

Stewart Clarke says a fresh outbreak of cholera takes place at the great fair at Hurdwar, nearly every year.

Dr. Montgomery, of Madras, has given a most careful and graphic account of the habits of pilgrims, and the origin of cholera among them. He says: "The Eastern pilgrims travel, either on foot, walking incredible distances under a burning sun, or closely packed in stifling carts, which are crammed to suffocation by human beings, and from which every breath of air is carefully excluded. Thus, they struggle along indifferent roads, or no roads at all, slowly dragged by miserable, half-starved, over-worked bullocks. Their food, indifferent in quality at the best, is cooked under the shade of a tree, or beneath the cart in which they travel; and they drink pernicious arrack, or fermenting toddy, or *offensive tank or well water, which is scarcely less pernicious.* At night they sleep in the foul conveyances in which they have travelled, or lie exposed on the ground, *chilled* by dews or damp, and subject to the influence of the cold land wind. If they stop at a native town, they crowd into the overfilled bazaars, and sleep, perhaps, in some filthy choutry (or travellers' rest-house), seldom little more than a shed en-

closed on two or three sides; and there they lie packed as close as may be, with the thermometer at seventy or eighty degrees at the lowest.

"Can it be wondered at that they are unhealthy? Is it surprising, if, on reaching the goal they seek, when they mingle with others influenced by similar injurious surroundings, and meet in a densely-crowded native town without sanitary precautions, and drink *water defiled* by cattle, the washings of carts and filthy clothing, and the bathing of crowds of foul human beings, they fall victims to disease? The wonder is that any should escape.

"Situated at a distance of forty-five miles from Madras is a native town called Conjeiveram. It is large, pretty, and regularly built; the streets are very broad, and planted with cocoa-nut trees; and a beautiful stream runs along its western side. The soil is very fertile; the river and surrounding tanks are favorable for irrigation and cultivation; the inhabitants are chiefly ryots (cultivators of the soil) and weavers; and many Brahmins reside there. The large pagoda or temple at Conjeiveram is greatly famed in heathen mythology, and is one of the great strongholds of Hindooism in Southern India. The city therefore appears to be favorably circumstanced for the maintenance of public health. Many of the inhabitants, and especially those attached to the temples, and also the leading cloth merchants of the place, are wealthy. It occupies a somewhat secluded position, and the mode of construction of the town, with its broad streets for the passage of large processions along its leading thoroughfares, is favorable to ventilation. The occupations of the people are healthful, much of the weaving being carried on out of doors; and the general health of the

natives is satisfactory. The festival is comparatively of short duration (about ten days), and held in the month of May, which is not unhealthy in that part of India. Yet, with all these advantages, the annual feast at Conjeiveram is almost regularly the means of introducing pestilence into Madras. Scarcely a year up to 1863 passed without an outburst of cholera, during or immediately subsequent to the festival; and its appearance in Madras, a few days afterwards, has been directly traced in many instances to the visitors returned from Conjeiveram. A better-marked example of the deadly effect of these festivals could scarcely be found. For here we have a town naturally tolerably salubrious, with a population independent and healthfully employed, and yet find that cholera appears with the aggregation of strangers, even though the majority of them have come comparatively short distances, and their stay is limited.

"Up to the festival of 1863 no provision of any kind of an hygienic nature had been made. No latrines or places of public convenience were erected, and an indiscriminate collection of men, women, children, bullocks, horses, and cattle, of all kinds, crowded and defiled the public streets, and polluted the water. Pigs, the natural scavengers of an Indian town, devoured the foul and decomposing excreta, festering under a tropical sun, and were subsequently slaughtered to supply pork for Madras. Mad revelry by day and night, when the tumult rendered sleeping a matter of difficulty even to a native, excited to a preternatural degree the religious zeal of the Hindoo; while excess and debauchery prostrated his energies and made him an easy prey to disease. The effluvium arising from decomposing excreta polluted the air,

and in this foul atmosphere the inhabitants of the town had to live, with an addition of two hundred thousand strangers. The carts in which the pilgrims came to the feast became saturated with the poisonous atmosphere. The clothing of the poorer saints, tainted by prolonged wear, and the various contaminations likely to arise during an orgie of days, rendered each of the miserable devotees, upon his return to Madras, the possible nidus of future disease. Exhausted, weary of excitement, with all the sustaining hope of religious zeal to support them gone, they hastened back to the presidency town, itself notorious for insufficient cleanliness, thus perilling the lives of all.

"In connection with the foregoing facts regarding the condition of a town, when the scene of a religious festival, we will next turn to the consideration of the effects left behind by bands of pilgrims traversing the land. Some of these come from the provinces of Upper and Central India, collecting from distant stations in bands more or less numerous, but sometimes amounting to thousands. Many of these, poor, ill-fed, and diseased, start on their tedious journey of some fifteen hundred to two thousand miles. The miserable caravan slowly wends its way, which, for obvious reasons, is that of the grand trunk roads of Southern India. Visiting the sacred shrines of Trichinopoly, weary and exhausted, they still pass on, till at length their courage is revived by the longed-for sight of the sacred island of Ramieseweram; for visits to this island, and bathing in the sacred waters, where the two seas mingle, are supposed to free from sin and give a passport to immortality. This belief explains the strong motive that impels all these pilgrims, who, so long as their religion lasts, will continue to flock to Ramieseweram, and to be a constant source of disease,

if stringent measures are not adopted to check the evils they give rise to. Ten years ago the population of the island was under five thousand, but no less than one hundred and thirty thousand annually arrived there to worship. To this a large addition must be made for those who failed to reach the goal; the hearts of many fail them, the money of others fall short; frequently death has checked them, for thousands of graves, unseen because unmarked, exist on these trunk roads of the pilgrims.

"But, perilous as is the journey thither, the return is even more fraught with danger. When their ceremonies have been performed, and when the strong feelings of religious enthusiasm have been gratified, they yoke their travel-worn cattle, and set their faces homeward. No longer upborne by excitement, the object of their lives fully attained, wearied, poor, and with no hope to cheer them on their way, they start on their return journey unresisting victims to the first morbific influence which assails them. On the home-stretch all the dangers of the outward route are encountered in an exaggerated form; they return to the filthy camping grounds before defiled by themselves; they listlessly occupy the same infected vehicles which brought them; they are depressed by the dread that spoliation of their property has occurred during their absence, and they are in a strange country, speaking an almost unknown tongue. Forced marches knock up both man and beast; and footsore, downhearted, and ill-fed, they fall an easy, unresisting prey to epidemic disease.

"Another prolific source of cholera is the great fair of Bigginuggar, which annually collects thousands of native traders, and, like that of Hurdwar at the issue of the Ganges

from the Himalayas, is equally with Conjeiveram and Ramieseweram, a source of annual danger. From these centres, cholera almost always accompanies the homeward-bound pilgrims or traders, and the gradual dispersion of the travellers is the immediate means of distributing and propagating the disease, if it has seized them. The villages on their route are visited, and as free intercourse with the villagers and frequent access to the crowded and unhealthy bazaars are inevitable and cannot be controlled, great diffusion of cholera results. The public roads and thoroughfares become saturated with elements of disease, and dangerous to troops or private travellers who are exposed to their emanations. We have but to recollect the numberless instances of cholera imported into moving camps or attacking private individuals to recognize the facility with which passers-by are often found to succumb under this contagion. Supplies have to be obtained from villages already infected by the pilgrims, and even the slight amount of intercourse thus arising may implicate the safety of a whole command. But, in addition to this explanation of seizures of cholera among soldiers, and independent of the predisposing causes which travelling itself originates, it is no fancied conclusion to infer that if troops *pass near or even rest for a short time upon tainted camping grounds*, they become the victims of disease. Of this latter point a sad proof was given within the limits of the Madras presidency, at least as affecting some of its army, for, on the breaking up of the Sangar division in 1860, many of the regiments, returning to their own stations, crossed the route of the pilgrims who had gone to and returned from Ramieseweram, and in numerous instances they were attacked with cholera. This was no rare coincidence, but occurred with such frequency and precision

that it must be deemed a natural effect of an undoubted cause. In 1859, Inspector-General Macpherson records, that a detachment of the 74th Highlanders were attacked with cholera from passing within one hundred yards of the camp of the 35th regiment when it was suffering under an epidemic of that disease. The same regiment was subsequently brought down to Madras to embark for England in 1864, and being most improperly encamped on ground defiled by previous occupation, for weeks, of the 76th foot, was attacked with cholera, and a great number of deaths ensued. In this case, the first occupants of the ground had not suffered from the disease; and in all these instances the troops were in high health; those from Central India had passed through a glorious campaign; they had won a large amount of booty, and were under the professional charge of medical officers of great experience, thoroughly competent to adopt any possible means to guard the lives and health of the men in their charge. Yet, they fell victims to the foul atmosphere and soil of *camping-grounds tainted by previous occupation.* The case of the 74th at Madras is another proof of the innate power of infected regiments to generate epidemic disease, for cholera was brought from the camp (six miles off) into Madras, soon took root and spread rapidly in a densely-populated portion of the city, remarkable for its want of ventilation and cleanliness. Analogous to the experience of the detachment of the 74th Highlanders (quoted above) who contracted cholera near Bellary from an affected camp by which it passed but did not halt, was that of a wing of the 43d regiment of Europeans, who passed through a village near Palmanair—one of a number of small native vil-

lages, skirting the frontier border of the Mysore table-land, and some two thousand feet above the level of the sea—it was seized with cholera, and the men brought into Madras dying by scores, some of their dead bodies lying among the living, for miles of their dreadful railway journey. If it were necessary to multiply proofs of the ill effects of native encampments and of native habits of travelling, they could easily be given.

"The native cities may be regarded as permanent filthy encampments. Madras abounds in cart-stands, where native travellers' vehicles are parked, places uncared for, apparently, by any one, and they are for the whole year round nuclei of epidemic choleraic disease. The larger up-country railway stations—as, for example, Coimbatou and Salim—are found to prove perfect nests of cholera; the virulence of which is maintained by an almost total absence of cleanliness. Cholera is always present in Calcutta, which we have already had characterized as one of the filthiest cities in the world. There is not a month in the year in which deaths do not occur from it, both European and native. It is the cause of one third of the total deaths, which vary from eleven thousand to sixteen thousand per year, out of a native population of about four hundred thousand. The deaths from cholera, from 1840 to 1850 were forty-six thousand, six hundred and ninety-seven; in 1850 to 1860, forty-five thousand, eight hundred and twenty-three. The smallest mortality in any one month was, forty-six, in July, 1843; the largest is generally in April.

"No language can be used that would be too strong to deprecate the wanton risk to human life which is needlessly allowed to cause such dire results; and no exertions should be

spared to save the life and protect the health of the general population of India, in villages, cities, and encampments. Very simple measures may suffice to ward off much of the danger now threatening citizens and pilgrims, and those who follow their line of march, and it may even be possible, by timely warning, to enable the commanding and medical officers of troops to guard their men against the dangers of pestilence from occupying old camp-grounds.

"In accordance with these views, in 1864, steps were taken to mitigate the evils alluded to at the grand feast of Conjeiveram. Cattle were, as far as possible, removed from the strict limits of the town. Public places of convenience were erected, and their contents removed twice a-day. The main streets were swept and watered, and supplies of *good water* were made available near places of public resort. As regards the result of these measures, Captain Cloete, superintendent of police, writes: 'In 1862 and 1863, at this festival, the effluvium arising from the hedges and ditches on the side of the main street was so offensive as to make it quite sickening to walk in the streets in the morning. In 1864, I walked a distance of about two miles at daylight, and experienced no more disagreeable smell than is to be noticed in the bazaar at all times. The contrast to the previous year was most marked, for not one case of cholera occurred during the festival, although it seldom or never, happens that cholera does not break out either in Conjeiveram itself, or among the people returning from the festival, or in Madras after the feast. I have not heard of any case in which the seeds of the disease were traceable, as having been sown in Conjeiveram. It and the adjacent villages have been singularly free from cholera since the festival, and, to my belief, Madras has been unusually so.'"

In this conviction, Captain Cloete is doubtless correct. Madras was unquestionably saved from an epidemic by the timely sanitary precautions observed at Conjeiveram. Of the particular caste of persons willing to do the scavengery necessary, none were to be found in the place, and they had to be forwarded from Madras, forty-five miles distant. This absence of the sweeper caste in Conjeiveram causes an accumulation of rubbish, house refuse, and excreta, to remain piled up in the yards, even of the wealthier classes, which alone is sufficient in a hot climate to breed disease. But even the scavengers did not bring back the disease to Madras. Mr. Kinsley says, in a report on these sanitary measures: "During the ten days of the festival the town remained free of cholera, and no cases occurred that year, although tradition says that ever since cholera was first known in India, it has never failed to make havoc among the Hindoo population at this festival. So notoriously was, and is, this the case, that it is said people from distant places, before starting for this feast, take solemn leave of their friends in anticipation of their never returning." Similar precautions were observed in 1865 with a like favorable result, although the year was notoriously unhealthy.

We are now prepared to point out the principal factors of an epidemic of cholera:

1*st.* An atmosphere impregnated with the products of *fermenting human excrement* is at once the most obvious and constant concomitant of the disease.

2*d.* An elevated temperature with a still, stagnant, and peculiarly oppressive condition of the atmosphere (more oppressive than the elevation of the thermometer can account for). During almost all cholera epidemics the nights

were warmer than the days; the atmosphere, on both land and sea, was singularly stagnant, and so unusually still, close, and hot, that it was impossible to ventilate even large houses, in which no change of air seemed to take place for almost a week together.

3*d*. Unusually high readings of the barometer, viz., over 30°, and up to 30.46°, and 30.48°. Such meteorological conditions have a marked tendency to favor the chemical decomposition of organic substances, and to render the season defective in those atmospheric changes, which, by decomposing and dispersing into space the products of putrefaction, renew the purity of the air.

4*th*. Lowness of site, swampy grounds, moist soil, decomposition of vegetable matter, and all those causes which tend to produce bilious and remittent fevers.

5*th*. *Foul camping grounds*, filthy streets and yards. There is much proof, that not only the fresh moist soil of contaminated grounds is injurious, but that these, even when in a dry and dusty condition, are equally dangerous. Numerous instances are given in India, in which travellers, merchants, and soldiers, have encamped upon parched and arid places, and have quickly sickened in great numbers soon after the dust was thoroughly stirred up by the movements of men and animals.

6*th*. *Impure water*, especially that which is poisoned by the washing of the persons or clothes of cholera subjects, or which has been fouled by cholera discharges directly emptied into it, or which has had cholera matter percolated into it through the soil, or by means of imperfect drains.

7th. Bad, spoiled, or defective food; especially spoiled or rancid meats or fish; unripe or stale fruits and vegetables, &c. The natives of both Hindostan and Egypt prefer unripe melons, and think all others destitute of flavor.

We agree substantially with Dr. McLean, Deputy Inspector-General of England, who concludes, from great experience in India, that cholera is generally propagated by human intercourse, and, in all probability, mainly by the poisonous actions of the excretions of affected persons, after they have undergone certain changes and decompositions; that camps and dormitories most under the influence of a privy or fæcal atmosphere, invariably present the largest number of cases and the heaviest mortality; that cholera always starts from some city or district in India, and is spread by pilgrims, bodies of travellers, or troops, who are in movement from village to village, or from one district to another; that a tainted regiment or caravan will disseminate the disease along its route; that a healthy caravan or regiment meeting with a choleraic one almost invariably contracts the disease, and becomes a fresh focus or centre of propagation along its line of march; that healthy bodies of men who camp on ground saturated with the discharges of cholera patients usually suffer severely.

Dr. Montgomery gives the following summary of the causes of cholera:

(1.) Undue exposure to the vicissitudes of climate, especially during cold nights following hot days, and the occurrence of certain atmospheric conditions, including frequently an absence of ozone.

(2.) Physical fatigue and nervous depression from prolonged

travelling, mental apprehension and sorrow; or fear, more especially of this disease.

(3.) Undue abstinence or deprivation of food, or the presence of injurious properties in it.

(4.) Excess in eating and drinking, and licentiousness.

(5.) Vitiated atmosphere from all foul causes, such as filthy camps, nasty houses, streets, yards, &c.

(6.) Direct exposure to the contagion of the disease.

(*a.*) As regards the first of these causes, the most unhealthy seasons in India are those before the commencement and at the close of the rains. These periods, technically called the monsoons, rapidly chill the air at their onset, and predispose to fevers and bowel complaints; while their termination, marked by the subsidence of floods, exposes decaying animal and vegetable matter to the influence of a tropical sun. Hence, out of 92,000 deaths, 65,000 occurred in the seven dry months, and only 17,000 in the five rainy ones. In twenty Aprils, there were 16,193 deaths; in twenty Augusts, only 2,586 fatal cases. The dry months are: November, December, January, February, March, April, and May. The wet months: June, July, August, September, and October. The hot months are: one half of February, March, April, May, and one half of June; the hot and wet months: one half of June, July, August, September, and one half of October; and the cold months: one half of October, November, December, January, and one half of February. Twice as many die in the cold months as in the wet; and more than four times as many in the hot as in the wet months. Natives suffer most in the cold months; Europeans in the hot months.

A heavy fall of rain for a couple of hours has often stopped an outbreak, at least, for a time. Macpherson always looked

with pleasure upon rain, certain it would relieve him from much of the anxiety which always attends the treatment of cholera.

As regards atmospheric phenomena, it will be remembered that when the cholera first appeared in India, in 1817, the year was from its commencement uncommonly moist, and the annual rains began in Bengal some three weeks before the usual time. The delta of the Ganges was so flooded as to become one vast sheet of water, and the rains exceeded the average of ordinary years by some thirty-three per cent. Jessore, the station from which the disease originated, was especially exposed to these injurious influences, lying as it did in a dense jungle, surrounded by stagnant water, and receiving all the filth of the up-country. The disease, in a mitigated form, was not however absent from other parts of Bengal, and more especially from Calcutta, which was then, and is now, one of the filthiest cities in the world. With appalling rapidity the pestilence spread through the different cities of Bengal, *up* towards the source of the Ganges, and beyond the Jumna. The territories of Oude and Rohilcund, lying on an elevated plateau, appear not to have suffered in the first instance, though they did subsequently. Within two or three months of the first appearance of the distemper it was brought to the camp of the Marquis of Hastings, then moving slowly through the low and unhealthy district of Bundelcund. A reign of terror followed its appearance—and the army became temporarily demoralized. The epidemic only lasted eight days, but during that time one thousand seven hundred and sixty-four soldiers and eight thousand native followers died. The sudden subsidence of the malady allowed the progress of the army, and its health became rapidly re-established.

(*b.*) Of the second predisposing cause, namely, physical fatigue and nervous depression, it need only be said, that experience has conclusively shown that individuals proceeding on long journeys, or after their conclusion, are markedly liable to be attacked. It has been conclusively shown from well-framed and trustworthy statistics, that the probability of cholera in the Indian army may be estimated as being in direct proportion with the number of men and the distance to be travelled. Macpherson alludes to the readiness with which, in certain districts, both European and native troops get cholera on their line of march. He says it is well known how pilgrims on their way through Lower Bengal and Orissa, strew the road to Juggernaut with their bones. Natives travelling are just as apt to suffer as Europeans. Previously fouled camp-grounds are doubtless active agents here. Mental or nervous depression is a recognized source of danger.

(*c.*) Undue abstinence, during which the absorbent system is unusually active and the nervous system suffers under hypersensibility induced by depressed vital power, tends to its development; particularly if any of the little food used is of an improper description, either from directly producing intestinal irritation, *or as wanting in nutrition.* To the importance of this latter source, too much attention cannot be given. The laborers on the canal of Suez were mainly preserved from cholera, in 1865, by the issue of additional rations of healthy animal food. Certain articles of diet have indubitably been the immediate and exciting cause of a cholera capable of propagation, and of inducing a fatal termination. Many vegetables, more especially of

the orders of cruciferæ and cucurbitacæ, cause many of the symptoms, and are capable of originating the disease, or at least of developing it when the seeds have been latent. Unripe watermelons are conspicuous among these articles of diet, and are consumed by the natives in immense quantities, more particularly when they are travelling and during the hot season—when pilgrimages are usually made. Its first appearance was by some referred to diseased rice.

(*d.*) Equally, if not more injurious, than insufficient or improper food is excess; and this is common among the Hindoos, in the use of alcoholic and narcotic stimulants and extreme venery, to an amount that would hardly be credited among European nations, but which is common enough among natives, particularly at festivals.

(*e.*) Of the evil effects of overcrowding in houses, and of the influence of bad air, it is not necessary to say much, but the imagination of an English mind, could never depict the extent to which causes of disease are allowed to exist in native towns. Mere humanity itself, can, as we know, poison the surrounding air and fill it with fatally morbific elements. In these cases, cholera is not of necessity produced, but a fruitful ground is prepared where its seeds will germinate and eventually spring up under favoring circumstances.

(*f.*) Last, but not least, among the immediate and direct causes of individual seizures of cholera, stands the exposure to its *poison*.

2. COURSE AND DISTRIBUTION.

Having thus, in some measure, accounted for the origin of cholera in India, it becomes our next duty to chronicle its progress and diffusion over the world. First, we recall the fact, that although it is over forty years since it first prevailed in China it has never crossed the atmosphere of the Pacific, while it has repeatedly been brought across the Atlantic ocean. In 1817, the facilities of travel in India were very much less than they now are in Europe, and we find that cholera then only travelled *westward*, about twenty-one miles per week. It is also presumable that there was a greater frequency and rapidity of commercial and personal intercourse between Eastern and Western Hindostan than between Calcutta and China; and we find that it only progressed about ten miles a week from the Ganges to Canton. When it reached Europe in 1830, it travelled from eighty to one hundred miles a week, and crossed the Atlantic, in old-fashioned sailing-vessels, at a speed of three or four hundred miles in seven days. Again, Moscow was the first large city in Europe reached by the epidemic of 1817, and it did not arrive there till 1830. At that time Moscow was the commercial emporium of Central Russia and Western Asia; pagodas, temples, churches, Chinese tea-houses, French cafes, Turkish bazaars, and Russian market-places, were there jumbled together; and Persians, Armenians, Tartars, Circassians, Russians, Poles, Germans, French, and other Europeans met in a common centre. Asia and Europe came together, and, of course, cholera found its way there also, and was thence distributed to Germany, England, and America.

To return to India. The first great epidemic commenced, as

usual, in the marsh region of the Ganges at Jessore; in a month it progressed one hundred miles south to Calcutta, which is one of the filthiest cities in the world, and raged there more than a year. It required between two and three years to traverse India, from Calcutta on the East to Bombay on the West, where it arrived in 1820, and destroyed over one hundred and fifty thousand persons. In 1821, it advanced to the northwest, pursuing the course of rivers and travelled roads to Persia, Arabia, and Asia Minor. There it seemed to stop for a time, and devastated Central Asia; but in 1829, it reached Southern Persia, and arrived in Moscow in 1830.

At one time it was quite common to assume that the cholera poison was wafted solely by means of a steady atmospheric wave. But we have no record of a wind which blew for thirteen years on the line from Calcutta to Moscow; while we know that in India, the disease advanced from east to west in the face of a monsoon blowing persistently night and day in the opposite direction, and marched down the western shore of the Bay of Bengal in the face of a similar wind. It followed the course of travellers and not that of the wind. Even of the first epidemic, it is stated by Professor Tommasini, on the authority of Dr. Frias, who had lived several years in Alexandria, that the disease was carried from Mecca to Alexandria by pilgrims returning from the feast of Kurbar-Bariam. There was no steamboat navigation on the Mediterranean in 1817 to distribute the disorder promptly.

The second great epidemic commenced in India in 1844, and by 1847 had reached Tantah in the delta of the Nile, where 165,000 pilgrims had assembled from all parts of Syria and Egypt; over 3,000 died there of cholera, and soon after the dispersion of this vast crowd, it appeared in Cairo and Alex

andria, and also quickly forced its way into Persia. In Lower Egypt alone, 55,000 died in 1847, out of a population of 2,500,000. It reached Moscow the same year; was carried again from Russia and Germany, in ships to London, in October, 1848, and arrived in America soon after.

About the present epidemic, or that of 1865 and 1866, we have gathered the following account: In the month of March, 1865, the cholera showed itself on the banks of the Ganges, its perpetual bed, and raged for twenty-two days as an epidemic without leaving the country; then, possibly, somewhat aided by a strong southwest wind, it began to move, dividing itself into two columns, one following the track of the Hindoo pilgrims as far as Mecca and Medina; the other, not less terrible, advanced by Affghanistan towards Cashmere and Bokhara, and thence forced a passage into the Russian provinces of Asia, and into Russia in Europe, accompanying the caravans of merchants. It broke out on ships with pilgrims, and also on the line of march of the Hindoo pilgrims on their way from India to Mecca, long before anything of the kind had occurred at Mahomet's shrine. Early in May, seven hundred thousand pilgrims and over one million of animals arrived at Mecca. Most of these were, of course, poorly clothed, had long been badly fed, and many of them were exhausted; they found no encampment worthy of consideration, no sufficiency of fresh, wholesome food, no full supply of pure, fair water; they made no latrines or drains; no one was ready or willing to bury the dead; they were exposed to great heat; and finally, on a particular day each pilgrim was required to sacrifice one animal. The enormous mass of blood and entrails which was cast among the other heaps of filth which had accumulated in a comparatively small place, was sufficient to engender severe dis-

ease: and, in addition, "cholera-matters" were introduced by the Hindoo pilgrims. It is below the mark to say, that forty thousand of the devotees died of cholera in 1865, at and near Mecca. We have seen that the festivals of the Hindoos at Juggernaut, Conjeiveram, and Ramieseweram, and their great fairs at Hurdwar and Bigginuggar, have often played an important part in the origin and distribution of cholera—hereafter the Kourban-Bairam, or "Feast of Sacrifices," at Mecca, will hold the first rank in public estimation. Mecca is so close to the east bank, and so nearly opposite the centre of the Red Sea, that it becomes a convenient place for the distribution of cholera. Nearly twenty thousand pilgrims from Mecca, all more or less infected, passed the Isthmus of Suez, early in 1865, in order to embark at Alexandria for Europe and Algeria. Suez and Alexandria were healthy until pilgrims returning from Mecca arrived there.

Dr. Frazer, a resident of Suez, says it is not only the great highway for intercourse and traffic between Europe and Asia including Australasia, but forms besides the chief route for the devout of the Islam world, from Asia and Africa, Bokhara, Turkey, and the Crimea, and from the very centre of North Africa. At Suez, cholera has always been distinctly traced to importation, and has in every instance been brought by the pilgrims on their way either to or from Mecca. It has been brought from North Africa and the Crimea, to Suez and Mecca, and *vice versa*.

From Mecca and Suez it quickly reached Cairo, where it raged only twelve days; the atmosphere of the city is excessively dry, as for twenty leagues around there is a complete absence of marshes. But the very place in Cairo, where the common people obtain their drinking water, is impregnated

with loathsome impurities; many large barracks are there and a numerous collection of grain and other boats in the vicinity, and the soldiers and boatmen use the river as a great cesspool or water-closet.

From Cairo it was carried to Alexandria, where it prevailed three weeks. Alexandria is a damp city, surrounded by immense marshes, and the air is loaded with *carbonic acid.* Cholera once lingered around St. Petersburgh for four years, apparently because that city is built on marshes, and the air contains at least four parts per thousand of *carbonic acid.* Cholera first appeared in Alexandria, on May 11th, 1865, near the railway station from Cairo, in one of the lowest suburbs of the city, and inhabited by 20,000 of the lowest class of Arabs, Greeks, and Maltese. It seemed to arise from one case, but doubtless many others were imported; only three or four died during the first two or three days; then eight to ten succumbed daily. By June 1st, there were 30 deaths per day; on the 17th, 61, and on the 25th, 183. At this time the sanitary condition of the city was infamous, and the water-supply, derived from the Nile, was charged in its course with decomposing matter derived from the carcasses of 700 animals lying in the canal. In Lower Egypt alone, over 80,000 died of cholera in 1865.

The malady was brought to Aleppo by a Persian caravan, August 14, 1865; at first there were only five or six deaths per day; then 40 to 50, and by September 1st, 250 died every twenty-four hours. It was also taken to Bagdad by pilgrims from Mecca, and thousands died in a short time.

For some days it was hoped that the disease would be stayed at Alexandria; but it soon appeared at Constantinople, and a few days later at Ancona, in the direct line of steamboat

travel. In Constantinople it is estimated that 50,000 persons died; and in one district of the city, with 2,000 inhabitants, between 300 and 400 succumbed. At Ancona, 1,346 died, out of a population of 46,000.

Constantinople, like all Turkish and Eastern towns, is distinguished for want of cleanliness; all offal and filth are thrown into the streets, and what is not consumed by dogs remains under a burning sun, a heap of putrefying vegetable and animal matter; the only drains are open ditches in the middle of narrow streets; their sluggish contents empty into the almost stagnant waters of the Golden Horn, for the current of the Black Sea passes so gently by the docks as to leave the water in the harbor almost unchanged.

From Constantinople the disease spread into the surrounding country, and in almost all cases the infection could be traced to fugitives. The pestilence was particularly violent at the first part of the epidemic; there were but few premonitory symptoms; cramps and vomiting were rapidly followed by collapse. In the city itself, there were, as a rule, only a very few cases in any recently-affected quarter, for the first day or two; afterwards, in a single night, countless victims fell, as if by one stroke from the avenging angel; then everybody took to flight; the dead were left unburied, and the sick were deserted by their relatives; for some days subsequently a few more cases occurred, and gradually such local epidemics seemed to burn themselves out. The same course which the scourge thus pursued in whole quarters of the city was also observed in single streets and houses; at first the disease was imported, and there was a case or two; suddenly there was an immense mortality, and then it gradually diminished. A single case in one house was quite exceptional; there were generally

several, and in some instances the whole population of a dwelling was literally swept away.

(*a.*) DISTRIBUTION BY SHIPS.

Pilgrim and emigrant ships may be broadly described as floating encampments of filthy people; and steamboats, on account of their greater heat below decks, increase all infectious diseases which may be brought to them. It seems that cholera has the same predilection for ships that yellow-fever has; both have a lengthened incubation at times, and may only break out long after the vessel has left port; and when the disorder is once established on board, it clings to the unfortunate boat with great tenacity. In yellow-fever, it is the exhalations from the patient and the vomits which are most dangerous; but in cholera the alvine discharges propagate the disorder; hence, bedding which has been used by cholera patients, and water-closets which have been visited by them, may retain the contagion for a long time. And it seems to be well-proven that the discharges of persons suffering from the milder forms of the disease, called cholera-diarrhœa, or cholerine, contain the poison just as copiously as the severer varieties. As early as 1819, an English frigate carried cholera from Ceylon to Mauritius and the Isle of France, whence it was taken, in 1820, to Zanguebar, on the east coast of Africa. It also arrived in the Philippines by ship from Madras in 1820. But, we first propose to turn our attention to the increase and conveyance of the disease by steamships during the present epidemic, or that of 1865 and 1866. In former times the principal movements of trade and pilgrimage from India were carried on by caravans by land, and in the case of the pilgrims to Mecca, the passage of the Arabian desert contrib-

uted to improve the health of the travellers. At the present day, owing to the conveniences and speed of steam travel, it is by sea, and in a very short time that these journeys are in great part accomplished. On the Red Sea Boats, thousands of Mohammedans of every nationality are now crowded, and numbers of pilgrims from India died on them, during the months of March and April, 1865. On one vessel alone there were no less than eighty deaths from cholera. If an epidemic breaks out among the pilgrims at Mecca, the next places, of all others, most likely to suffer, will be Suez, Cairo, and Alexandria; and if the disease reaches Alexandria, the first town in the Papal states will be Ancona, as the communication between the two places by steam is most perfect. The next most exposed places, are: Constantinople, Malta, Marseilles, and Gibraltar. And this is the exact route which the epidemic pursued, for, within two or three days after it was decidedly fixed at Ancona, it also appeared in Constantinople. As far as the latter city is concerned we are in no doubt about the origin of the disease, for it was brought from Egypt by a frigate, *the Mourbir Sourour*, laden with stores, and charged with infection; two cholera patients were landed from her on July 8th, and by the 12th thirty fatal cases had occurred in the hospital, whence it spread into the city. Thus, the epidemic quickly became active at three great centres: 1st, at Alexandria, commanding the whole of the Mediterranean from Tripoli on the east to Barcelona on the west; 2d, at Ancona, controlling the gulf of Venice; and, 3d, at Constantinople, the head of navigation of the Black sea. Steamships played a most important part in carrying cholera to various parts of the Black sea, and up the Danube; finally the regular lines were discontinued when it

became only too evident that the disease was carried on, and distributed from them. At one time they were filled with those flying from the various places where the pestilence prevailed, and outbreaks of cholera occurred at the different landings soon after the arrival of the boats. It would also pass by cities nearer the localities where the disease was raging and attack others more distant, but with which steam communication was more frequent and direct. It is stated positively that the epidemic took an overland route in no single instance, at first, but travelled from one coast town to another, as it was carried by steamships. It was also introduced into Beiroot by steamers, some of whose passengers died at the quarantine, others in the houses, or even in the very streets of the town. It reached Malta in the direct line of steamboat travel by August 28th, and Marseilles on September 11th. In the course of five days, four steamers arrived at Marseilles direct from Alexandria with six hundred and sixty-two passengers, some of whom were Algerine pilgrims from Mecca. One vessel brought sixty-seven pilgrims; two more had died of cholera on the voyage, and one immediately on landing. At this time there was no cholera in Marseilles, but in eleven days it prevailed as an epidemic. By September 24th, it reached Paris by railroad from Marseilles; on September 22d, it arrived in Southampton, by steamers direct, in four days, from Gibraltar, where the disease was also raging. This is the first time that cholera has reached England by the way of the South; in 1832 and 1848, it was introduced into England from Russia and North Germany, and directly traced to ships arriving from Riga, Cronstadt, Hamburg, and Dantzig, where the disease prevailed in those years, before it did on the Mediterranean. In fact, in January, 1833, an English ship brought down the dis-

ease to Lisbon, whence it spread to Portugal and Spain; did not reach Marseilles till December, 1834, nor Lombardy and Venice till 1836, and Trieste in 1837.

The point of attack of every epidemic in England has always been at one, or the other, of the principal seaport towns. In 1832, it was originally brought from Hamburg to Sunderland, where the German Ocean has its greatest width, and the distance is too great for the disease to be blown across. In 1848, it first broke out in London, and could be clearly traced to Hamburg emigrants, as cases of cholera had occurred on the vessel by which they arrived. The third general epidemic reached St. Petersburg in October, 1852; prevailed extensively in the north of Europe in 1853; reached Hamburg on July 28th, and was carried to Liverpool by August 22d; still arriving in England by the northern route, and not by way of the wind, which would have reached the eastern shore of England before it did the western, on which Liverpool is situated. In 1866, after the disease had prevailed in various parts of Germany during the winter, it was brought down the Rhine to Rotterdam, and thence taken in a direct line to Hull, on the eastern coast of England, and subsequently, by rail, to Liverpool.

Cholera has always been brought to America by ships. Early in 1832, the brig Carrick, bringing emigrants from England, arrived at Quebec; forty-two of the passengers had died of cholera on the voyage, and it broke out in a severe epidemic form at Quebec, on the 6th of June; by the 10th, it had travelled up the St. Lawrence to Montreal, and soon reached Detroit. In the latter part of June the ship Henry IV. arrived at New York with cholera patients, and the disease appeared in the city by the 24th; it spread up the Hud-

son river, and joined the Canada trail. From New York it also was quickly carried to Philadelphia and the West. Again, during the second epidemic in Europe, two vessels sailed from Havre, where cholera prevailed; one, the New York, for New York, the other the Swanton, for New Orleans. Both vessels carried large numbers of German emigrants; on one the cholera appeared when sixteen days out, with fourteen deaths; on the other, in twenty-six days, with thirteen deaths. The New York arrived at Staten Island on December 2, 1848, and a severe epidemic soon broke out, but was confined to the Quarantine grounds. The Swanton arrived at New Orleans December 11; no quarantine was instituted, and in two days cholera patients were taken into the Charity hospital; this was the beginning of a severe epidemic, which lasted the whole of the winter, which was unusually mild. There were three or four hundred deaths from cholera in New Orleans, in December, 1848; about six hundred in January, then increasing till June, when there were two thousand five hundred. On the 20th of December, it reached Memphis, by steamboat, from New Orleans, where for twenty-five days it remained confined to the landing-place, and to the persons communicating with the vessel; then it began to spread to the more distant houses. In the spring of 1849 it was brought to St. Louis and Cincinnati, and the whole valley of the Mississippi was finally involved. By October of the next year, it reached Sacramento, by means of overland emigrants; and almost simultaneously arrived at San Francisco by the United States mail steamer Northerner from Panama. The Chinese in California suffered the most severely; the disease was brought almost around the world, by way of the west, to reach them there. It is probable that with increased steam communica-

tion to and from San Francisco, it may soon be brought direct from China, across the Pacific ocean.

In the latter part of 1853, cholera was brought to Liverpool and prevailed during the winter, more or less extensively throughout England. In the fall, cholera-ships came in great numbers to New York; in October alone, twenty-eight infected ships arrived with eleven hundred and forty-one cases, and the disease became epidemic on the Quarantine grounds at Staten Island, but seemed to die out during the winter. In the spring, however, other vessels added fresh infection to the embers of the old, and the first case occurred in New York, on May 11th, and thence spread, as usual, to the larger cities on the regular lines of travel.

Dr. Swinborne, Port physician of New York, gives the following account of the origin of cholera on board the Atalanta, in 1865: She sailed from Havre, on October 12th, with fifty-two cabin and five hundred and fifty-two steerage passengers, all of whom had been a few hours or days in Paris, where cholera prevailed; and five days at the hotels, *Weissen Lamm*, and *Hullgarder Hof*, in Havre. While at these hotels, emigrants who had arrived only a few days before, were taken ill with cholera and sent to the hospital. On the first day out (October 13th), a little child from the *Weissen Lamm* died; in six days, five deaths occurred in one party from the *Hullgarder Hof*. In all, the Atalanta had one hundred and two cases and twenty-three deaths. The Hermann arrived shortly after (November 16) with several cases, and the first death on board occurred in the very family who had lost their mother of cholera at the *Hullgarder Hof* at Havre. It is also significant that the Atalanta, Mary Ann, Hermann, and Harpswell, all had names on their passenger-lists the owners of which were not

to be found among the passengers, but were declared to have been sent to the hospital at Havre. Up to November 17, there had been six thousand deaths by cholera in Paris and the department of the Seine. Another account says: The cholera of 1865 made its first appearance in Havre, on October 10th, and was undoubtedly brought there by German emigrants, of whom about nine hundred arrived between the 7th and 9th, from Paris, where the disease was at its height. These emigrants were *en route* for New York, and the cholera broke out among them on the 10th; eight died in forty-eight hours in the hospital, and two or three more in the emigrant hotels. Many of these emigrants sailed on the Atalanta for New York on October 12th.

The steamship England, from Liverpool for New York, bringing the same class of passengers, was obliged to put into Halifax, in distress, on the 9th of May, 1866, having had one hundred and sixty cases of cholera and fifty deaths, on that short voyage. On the 18th of April, the steamship Virginia arrived at New York, with over one thousand passengers, most of them Germans, who had come from infected places on the Rhine; about fifty died of cholera on the passage.

We all know how cholera prevailed in Paris; how it obtained but a slight foothold in England last year. How it lingered along the Rhine last winter, and recommenced this spring; how it was conveyed by German emigrants down the Rhine to Rotterdam, and thence to Hull and Liverpool; and we all know how many abortive attempts have been made to land it in this country from the steamships Atalanta, Helvetia, Virginia, and others. The history of the cholera on board these vessels is somewhat peculiar; they and they alone brought cholera to our shores, although other vessels were

bringing emigrants of the same class and nationality; but they and they alone, had a lower or orlop deck for passengers, below the water line, where three or four hundred persons, out of one thousand, or more, were kept in darkness, heat from the boilers and furnaces, in their own filth, and with very imperfect ventilation. Almost the counterparts of the climate and injurious influences of India were here reproduced artificially, and cholera might almost have originated anew on board this peculiar line of steam-vessels. Not a single case occurred in the comparatively well-ventilated cabins while it raged among the poor steerage passengers.

It is significant that cholera has always lingered in Europe during the winter preceding its occurrence in America.

(*b.*) DISTRIBUTION BY WIND.

It may safely be affirmed that wind plays but an occasional and insignificant part in the conveyance of cholera; a favoring gale may promote its transmission somewhat, and an adverse one can only retard it temporarily. Dr. Parkes once thought that it generally progressed with the wind and not by the shortest route of human intercourse, or even by the way of the greatest travel; but, in 1864, he writes: "On looking back to the epidemics I saw in India, I can perceive many points which are capable of a different explanation, if putrefying stools are the cause." Still, when these become dry, they may be blown about by the wind, and some observers have even noticed a peculiar aromatic smell in the air (odor cholerica) when cholera prevailed. The rapidity with which the "rice water discharges" must pass into a dry state, under the burning rays of a tropical sun, renders it highly probable, that in India, dust, the so-called "*cholera-dust,*" takes a large share in

the distribution of cholera. This remains on the camp-grounds where the disease has prevailed, and may be blown to greater or lesser distances by the wind; and very frequently it is stirred up by men and animals and carried about in their clothes and skins. In India such cases are thought to be numerous. In 1854, one wing of a cavalry regiment, just arrived from England and in high health, ascended the Ganges in boats; at a certain period of the voyage it arrived at a part of the country where cholera prevailed in the villages on the banks of the river, but with which they did not communicate. There, cases of the disease occurred in the boats, and the men were advised to push on rapidly, and in a few days after, when they had passed the limits of the existence of the disease on the banks, it ceased to show itself among the troops. The other wing of the regiment followed some time afterwards, by the same mode of conveyance; became affected with cholera at the same place, and lost it again at the same point. These attacks were thought to have arisen from inhaling the air, or cholera dust blown over the river from the infected villages; but, they may have been caused by drinking the river-water, contaminated, as it must have been, with "cholera matters." Another case seems to point to its diffusion by the air alone: In one of the Western Islands off Scotland, the most remote from the main land, cholera suddenly appeared, when so little intercourse existed with the place, that the clergyman had continued to pray, regularly every Sunday, for King William the Fourth, for eighteen months after Queen Victoria had ascended the throne. Still, one or more persons with cholerine may have crossed over from the main land. Again, on the arrival of an infected steamer from Egypt, in 1865, which was permitted to perform

a three days' quarantine off Beiroot, almost the entire crew of a British corvette, lying at anchor to windward, suffered severely from diarrhœa. In this case, the bilge and washing water of the infected ship, and the scrubbings of the privies and the discharges of the cholera patients, may have been carried down by the wind to the corvette, and contaminated water may have been used to wash her decks. At Naples, in 1865, the number of cases began to increase coincidentally with the sirocco wind. Hence the sirocco was supposed to carry cholera with it. This theory lasted till the wind changed and blew from a northerly direction, with greater violence than had been known for years before. Still the malady grew worse, and the greatest havoc by it was almost all on those blustering days. Cholera had already got a footing by means of individuals in Naples, and the public sewers and drains were in a horrible condition. In 1832, Dr. Vaché lost thirty small-pox patients in hospital at Staten Island from cholera, where the distance between the hospitals was between two and three hundred feet, and strict non-intercourse was enforced. But it may have been conveyed by clothes, or washerwomen. Dr. Bryson found it on the English fleet, when several miles off shore, after a cruise of some duration, and *before* any communication had been had with the land. In other cases it is said to have been noticed that vessels would become infected at anchor, in harbor, when the wind blew from the shore, or over other affected vessels. It is possible that it may be carried a *short* distance by the wind, but not far, as the poison soon becomes so much diffused as to lose its power. Others think it can be blown long distances, and cite the fact that infusoria have been found three hundred and eighty miles from the coast; that ashes from Vesuvius

have been carried by the wind to Venice and Greece, and have even reached Calabria, fifty leagues off in a thick cloud; and that the same has happened from Mount Hecla. They bid us to remember, in this connection, that a wind barely sensible moves at the rate of two miles an hour; a gentle breeze, five miles; and a very strong wind twenty-five miles; and a gale, forty miles. Still, as Dr. Sayre has pertinently put it, it did not move two hundred feet, nor twenty feet, from the steerage to the cabin passengers, on board the Atalanta, England, Virginia, and many other steamships, notwithstanding all the breezes which blow on the Atlantic. Again, in the epidemic at Ebrach, in Bavaria, in 1854, of over two hundred soldiers, guards, nurses, servants, physicians and clergymen, not one was attacked who did not use the affected privies of the prisoners, or wash their clothes.

(*c.*) DISTRIBUTION BY DRINKING-WATER.

Impure water is even more injurious than foul air, filthy people, contaminated soil, neglected sewers, cesspools, and privies. In places where the water is not as pure as the Croton water of New York, nor as perfectly protected by pipes, the choice of water for drinking and culinary purposes demands great care; and that taken from rivers which pass cities and towns is particularly objectionable, as it is certain to be contaminated with sewerage matters. Thus, Croton water contains but 6.66 of impurity; London water from 19 to 35; and Paris water from 24 to 46. If a little of the sediment from the Thames water, after being well dried, be held for a minute or two over the flame of a candle, it will emit an odor which is most disagreeable and disgusting, arising from the evolution of gases from the decomposition of

organic matter. The consequences of drinking such water in cholera times have been fully developed by Dr. Snow. He tells us that the South districts of London are mostly supplied with water by two companies, the Lambeth, and the Southwark and Vauxhall. In 1849, the water of both companies contained the sewage of London as it was washed to and fro with the tide, and the whole of the districts which they supplied suffered severely with cholera. In 1852, the Lambeth company changed their source of supply to Thames Ditton, a part of the river beyond the influence of the tide, and out of reach of the sewage of London. In 1853 and 1854, the districts to which this new water-supply extended suffered less than in 1849, and the houses supplied by the New Lambeth water not nearly as much as the others. The pipes of both companies go down all the streets, courts, and alleys. Some houses are supplied by one company, and the rest by the other; in many cases a single house has a supply different from that on either side. Each company supplies both rich and poor, both large houses and small, and there is no difference in the condition or occupation of the persons receiving the water of the two companies. No experiment could have been devised which would more thoroughly test the effect of pure and impure water on the progress and distribution of cholera than this, which circumstances placed ready-made before so careful an observer as Dr. Snow. The experiment, too, was on the grandest scale. No fewer than 300,000 people of both sexes, of every age and occupation, and of every rank and station, from gentlefolks down to the very poor, were divided into two groups without their choice, and, in most cases, without their knowledge; one group being supplied with water containing the sewage of London, and among

it, whatever might have come from cholera patients; the other, getting water comparatively free from such impurity. Dr. Snow obtained at the Registrar-General's office a list of deaths from cholera during the first four weeks of the epidemic of 1854, and went to the houses himself to ascertain the character of the water supply. There were 334 fatal cases in all, and 286 of these had lived in houses supplied by the impure water of the Southwark and Vauxhall Company; and only fourteen in those dependent on the Lambeth Company; in twenty-two instances, the water was obtained by dipping a pail directly into the Thames; in twelve cases, from pump-wells, &c. Cholera was fourteen times more fatal to those who drank the impure water. In another period of three weeks, 997 deaths occurred in houses supplied with the foul water, and only eighty-four in those which got the purer liquid. There were six hundred and eleven deaths among the patrons of the Lambeth water, and three thousand four hundred and seventy-six among those of the other company. Dr. Snow has also distinguished himself by the pains-taking manner in which he has proved that cholera may be distributed through the medium of drinking-water, by the cholera evacuations getting into *pumps* and other local supplies of water, owing to accidental communications between privies, drains, or cesspools, and the wells. The most striking feature of these outbreaks is, that they occur very suddenly and nearly simultaneously, and very soon after a single case has happened among the persons whose evacuations contaminated the water. In a very severe outbreak of cholera which took place in Wandsworth road, London, in 1849, the water was not habitually polluted, but became so by the bursting and overflow of the house-drains into the water-tanks, during a thunder-storm. The houses in

which this catastrophe occurred were seventeen in number; they were semi-detached villas and genteel suburban dwellings; they were drained and supplied with spring-water on one plan. The water was conducted into a series of tanks placed underground at the back of each house, at the same level, and the water which overflowed ran into a drain which also received the house-drains and the overflow from the cesspools. The contents of this drain were forced back into the drinking-water tanks at the time of the thunder-storm, and when the tanks were afterward opened by the Commissioners of Sewers, privy-soil was found from six to nine inches deep in them. In order to explain how water can be used under these circumstances, it is necessary to state, that when privy-soil is left at rest in water, it settles principally to the bottom, leaving the water above not much altered in physical appearance. At the time of the overflow of the drain, a lady in one of the houses had been suffering for two days with cholera, of which she died two days afterward, and two days subsequently to her death the great outbreak took place. About half the persons living in the seventeen houses were affected, and about one half of them died. The attack extended to all the houses in which the water was polluted, and did not reach any others, though there were plenty of houses both in a continuous line with these, and before and behind them. Dr. Snow also gives a very full account of the fatal and extensive outbreak of cholera which occurred in 1854, in Broad street, Golden square, London. He quickly suspected some contamination of the water, of the much frequented Broad street well, took away the handle of the pump on his own responsibility, and quickly put an end to an epidemic which had already caused six hundred and fourteen deaths. Dr. Snow

made inquiry at every house in which the first seventy-three deaths took place during the first two days of the epidemic; sixty-one persons had certainly drank of this water, and the others had all died or moved away except six. The parish authorities made excavations and found that the contents of a cesspool, situated only three feet from the well passed through its decayed walls, and percolated through the intervening ground and then ran through the open brickwork of the side of the well. A child had died of cholera in the house to which the cesspool belonged, three days before the great outbreak and its dejections had been emptied into the cesspool. Seventy workmen of a brewery quite near the pump escaped entirely, because they had a well on their own grounds; and the inmates of the workhouse situated in the infected district enjoyed a like immunity, from having a pump of their own. A lady who formerly lived in Broad street, but had moved to the West end, had the water from this pump taken out of town to her every day; she and a niece who was visiting her were fatally attacked with cholera, and her only servant had a severe attack of diarrhœa. A remarkably corroborative fact has been reported by Mr. Lawrence: Bethlehem Hospital and an asylum for children stand near together, on an open space of ground between fourteen and sixteen acres in extent, in the parish of St. George, Southwark. Being dissatisfied with the filthy water then supplied by the Lambeth Company, the governors of these two institutions, some thirty years ago, sank Artesian wells on the premises and the pure water thus procured is used exclusively by the inmates, about seven hundred in number; it is said there has not been a single case of cholera in the hospital or asylum in any of the three epidemics, although the disease has prevailed extensively in the

streets in their immediate vicinity. The epidemic of 1849, at Paris, was evidently spread extensively by means of impure water ; and at Sevres, diarrhœa frequently became epidemic among those who drank the water of the Seine and ceased when that from an Artesian well was used. In 1865, the clothes and mattresses of cholera subjects were washed in the basin of a public fountain at Tavatola ; unfortunately the waste pipe was broken and the foul water was carried into the clean ; and in one day sixty people died in a small section of the city, supplied with this fluid. There were terrible epidemics in 1861 and 1862 at Mean Meer, in India, and the water was not only found brackish, but tainted with fæcal impurities. The British man-of-war Euryalus had a healthy crew when she went to Tokohama ; but the ship's water was taken from a reservoir situated in a paddy field, which was manured with human ordure, and where the Japanese had been seen to wash their soiled clothes ; three hundred and forty cases of bowel-disease occurred among five hundred and twenty men. The small Epping epidemic of 1865 is also quite instructive ; a gentleman had been indisposed for two years with indigestion and great lowness of spirits, and his wife and mother had been out of sorts for a long time. Their sole supply of water came from a deep well, situated down the hillside ; this water had had for a long time an unpleasant odor and nauseous taste, and sulphuretted hydrogen was detected in it, with much organic matter. They were ordered away to the seaside and improved greatly, but unfortunately on their return stayed a day or two in Southampton and Portland, where cholera prevailed ; they returned home, were attacked with the disease, and eight persons out of eleven in their family died, including one of the physicians. Their house was half a mile away from any other

residence; it was on a hill; the temperature was falling, so that heat had nothing to do with it; they were attacked suddenly, so that fear had nothing to do with it; there was no pervading atmospheric influence, for there were no other attacks in the neighborhood; there was plenty to eat and drink, so that poverty had nothing to do with it. But a leakage was found in the pipes of the water-closet which ran under the foundation of the house down towards the well, and sewage-matter was not only distinctly traceable on the outside of the well, but privy filth was found at the bottom of it. It is very evident that pumps and wells which are located near and below the level of drains, cesspools, privies, or stables, may become very dangerous in cholera times. It is also probable that in all cities which are built on hillsides, the receptacles of drinking-water in the lower parts may become contaminated by foul drainage getting into them from the higher ground.

(*d.*) DISTRIBUTION BY INDIVIDUALS.

Persons, already sick with cholera, are the most active agents in disseminating the disease; they, and they alone, contaminate the air, water, and soil, and bring the disease to our houses, ships, and camps. Among the most striking proofs of this, we select the following: In October, 1865, there was no cholera in Western Germany, until it was imported into Altenburg, near Leipzig, in the very heart of Saxony. A lady and her daughter left Odessa on the 16th of August, when cholera was at its height there, and travelled nine days and nights continuously, to reach their home in Altenburg, on the 24th. The daughter had cholera-diarrhœa when she started, and died in Altenburg in a few days after her arrival. The mother, who had been well previously,

sickened on the 27th with real cholera and died in two days; her sister-in-law was attacked in the same house on the 29th, and died in twenty-eight hours. This dwelling formed the first centre of infection, from which the disease extended. The epidemic lasted from August 28th to November 18th, and one hundred and eighty cases occurred in all, of which one hundred and eight were fatal. It is asserted that Altenburg was in an unusually healthy condition, but that the inhabitants live mostly on vegetables, black bread, coffee, and beer; meat being only used regularly by the better classes. The disease spread from Altenburg to Werden, a neighboring town, by railway communication, and up to October 20th, 1865, there had been one hundred and forty-nine cases there, with fifty-two deaths. It is justly thought that this isolated outbreak of cholera in a previously healthy district, and which was clearly traced to persons coming from a centre of infection, must prove an important link in the evidence already accumulated to prove the portable and contagious nature of the disease, and its comparatively long period of incubation, at times. The sequel of this Altenburg epidemic promises to become still more interesting; for in a late paper we read: "No cases of cholera have been reported from the Prussian army in Saxony, but the close vicinity of this disease at Altenburg makes people look with apprehension on any marked change in the weather, and the heat has much increased of late." The very next steamer brought the following: "The Prussian government is much disquieted at the spread of cholera in the army; for on the 4th and 5th of June, thirty-one cases, six of which were fatal, occurred in the 3d regiment of the guards." A letter from the Grand Duchy of Luxembourg, states that the greatest

alarm prevails throughout the district, owing to the dreadful ravages made by cholera; the disease was first brought by a workman from Paris; it soon spread to eight towns, and in Diekirch, destroyed over one hundred persons, in three days, out of a population of two thousand. Pettenkofer thought he had traced the origin of cholera in Munich, in 1854, to those who brought goods to the Great Exhibition. On July 17th, cholera-diarrhœa commenced among them, and by the 25th, thirty cases occurred daily; one hundred and forty-four cases in all were reported in July, five hundred and forty-nine in August, two hundred and thirty-six in September, and thirty-nine in October. From these persons and the privies of the Crystal Palace, and those of the houses in which they boarded (for two hundred and fifty-three of them lived in no less than two hundred and forty-two dwellings, situated in one hundred and ten different streets), the disease is supposed to have spread through the city. Cholera occurred in no less than one hundred and twelve dwellings out of one hundred and seventy occupied by this class of persons, and it was also noticed that the disease almost always commenced three of four days earlier in them, justifying the opinion that it originated there. The first case of cholera had been preceded by diarrhœa for eight days. Again, in the prison at Ebrach, in Bavaria, a man named Lorenz Grassl, was brought from Munich, with cholera-diarrhœa, after being detained several days in a police-station where cases of cholera had occurred. In a few days he came under treatment for severe diarrhœa, which progressed to cholera, but from which he recovered perfectly. The privies which extended through every story of the prison, were in a most disgusting condition, and it is supposed that the discharges from this one cholera patient infected the whole

offensive mass, so that a severe epidemic soon commenced and killed fifteen per cent. of the prisoners. The disease was not confined to the men, for in a very short time it appeared among the female prisoners, who were entirely separated from, and had no direct communication with, the males; but a woman, named Anna Maria Hefer, washed Grassl's clothes, and she was the first to be attacked among the women. No efficient disinfectants were used. About the same time another Bavarian prisoner was taken from Munich to Kaisheim; he did not sicken for twenty-two days, and then died of cholera in seven hours. Disinfectants were thoroughly employed, and the disease was confined to this one case. Dr. Sayre asserts that in 1849, the epidemic in New York did not originate in Baxter street, but proceeded from an infected person who escaped from quarantine, and I have heard of two persons in the first stage of cholera who escaped quarantine inspection this year. Dr. Atlee of Pennsylvania, asserts that one day in 1854, a car load of emigrants came from Philadelphia, to Columbia, Pennsylvania; two or three of the passengers ill of cholera were put out on the platform at the railroad station; four gentlemen seeing them there at the point of death, carried them to a shed and waited upon them; in forty-eight hours not one of these was living, and in two or three days more, cholera prevailed extensively in Columbia. A few days after the outbreak in Columbia, an emigrant reached Lancaster, ill with cholerine; shortly after two or three cases occurred in Lancaster. The same train carried the cholera to Pittsburgh. Dr. C. A. Lee reports the case of a gentleman who had been exposed to cholera in Buffalo in 1832, returned to his home at Mount Washington, Massachusetts, one thousand five hundred feet above the

ocean, and died there; of eight neighbors who nursed him, six were attacked and four died; there were no other cases within fifty miles, and there seems to be no doubt the gentleman brought it with him, and distributed it to his friends. From similar and other cases, Dr. Niemeyer has come to the following conclusions: 1st. That cholera properly belongs neither to the class of contagious, nor to that of non-contagious diseases. 2d. While it is certain that cholera is often not communicated directly from one person to another, even under circumstances of the greatest intimacy; on the other hand, it is equally evident that it is spread *only* by patients afflicted with the disease. 3d. The disorder is propagated by the evacuations of individuals infected with cholera, *probably in all*, certainly in most cases. 4th. By means of one infected person, in whom the disease has manifested itself only by a seemingly insignificant diarrhœa, cholera can be conveyed to distant and hitherto healthy localities. 5th. This person may travel on and recover without further serious development of the disease in himself, but he may have left behind him in several or many waterclosets, a substance which may give rise to most deadly epidemics. It is thus no longer inexplicable why the cholera in its wanderings takes no defined course at times, but spreads now with the wind, and now against it: how it always follows routes of travel, and since the building of steamboats and railroads, has been able to spread more quickly than before; why it follows only one or a few tracks across the ocean, but takes a hundred roads on land.

Although it should have been evident many years ago, the portentous fact now stands out more prominently this year than ever before, that a great length of time may elapse between the departure of passengers by ship, wagon, or rail,

and the outbreak of cholera. In May, 1854, the epidemic broke out in Chicago and Detroit before it did in New York, where the cholera subjects landed. Many emigrants passed through New York, from infected ships, and were in passably good health at the time. Detroit and Chicago are in the line of the principal emigrant travel; cholera had been in neither city since 1849, and none but emigrants from infected ports in Europe, and from infected ships at New York, were attacked at first. It is evident that some of them must have had cholera-diarrhœa, or cholerine, or carried about with them in their clothing and baggage a poison capable of regenerating itself and spreading abroad an influence that produced a general epidemic in the warm months. On board the New York and Swanton, in 1849, we have seen that the disease delayed its outbreak for sixteen and twenty-six days after the sailing of these vessels. As early as 1853, Pettenkofer proved that the period of incubation might be extended to twenty-one days. Finally, it is well known that cholera has lingered in South Germany, Saxony, and along the Rhine, during the last winter; thence infected emigrants were brought by rail and steamboat, to be shipped from Rotterdam to Hull, on the east coast of England, then conveyed by rail to Liverpool, and reshipped by the England, Virginia, Helvetia, and other vessels to New York. Cases of cholera have already occurred at Bristol, Hull, and Liverpool, and the English authorities are at last becoming painfully aware of the comparatively great length of time which can elapse between the departure of infected persons and things from the continent, and the outbreak of cholera in England, or at sea. Depots of cholera are now established at Rotterdam and Antwerp, for on the Helvetia, which was sent back to Liverpool, all

the earliest cases are found to have been Dutch, not Germans, as their names, Evert de Boer, Peter Relpet, Neisen Gow, Coserline Bosake, undoubtedly prove. But there can be no doubt that the German emigrants who have been pouring through Rotterdam for nearly a year, originally brought the disease there. Since writing the above we learn that there have been 180 cases and 84 deaths at Antwerp ; 724 cases and 431 deaths at Leyden; 706 cases and 433 deaths in Rotterdam ; 305 cases and 169 deaths at Utrecht; in all, up June 13th, there have been 2,449 cases and 1,438 deaths in Holland. In Prussia it has declared itself in Berlin, Stettin, and seven or eight other towns. In France, at Amiens and Nantes. The caravans to Mecca have suffered much more severely this year than in 1865.

(*e.*) DISTRIBUTION BY CLOTHES.

After cholera matter has passed into the *dried* state, healthy men may carry it about in their baggage. Numerous and well-authenticated examples of this have been published, but the most extraordinary instance of the conveyance of cholera-vapor, or " cholera-dust," was furnished by the postal department at Marseilles, in 1865. The clerk who opened the despatches from the East, fell sick, with cholerine, another was put in his place, and the same effect followed up to the fifth. Of nine clerks in the bureau of arrival, eight were taken sick, and one died ; of twenty-two clerks in the bureau of departure, there was not one case of sickness. In 1848, two vessels, the Swanton and the New York, left Havre, the one on the 31st of October, the other on November 9th ; the one destined for New Orleans, the other for New York. Both vessels carried a large number of German emigrants. On the one, cholera

appeared when sixteen days out; on the other, in twenty-six days; or, nearly on the same day in the two vessels, which at that time were one thousand miles apart; the one in a low, the other in a high latitude. Some days before the outbreak on the New York, a very cold wind sat in, and there was a general ransacking among the baggage for warm clothing. On board the Swanton, just before the occurrence of the epidemic, the weather was excessively warm, and the passengers searched for lighter clothing, and also rummaged their baggage. In both vessels there were passengers who had left infected places, and Dr. Clark infers that it is far more probable that the poison was carried in their baggage, than to suppose that two different atmospheric currents of cholera struck these two vessels a thousand miles apart. As regards the ship New York our information is minute. Among the passengers were a number of German emigrants who came from a place where cholera prevailed. One of them had a chest of clothing that belonged to a person who had died of cholera. Near Cape Sable the weather became cold and boisterous; the chest was opened and the clothing used; by the 22d of November five persons died of cholera on shipboard, and twelve were landed sick with it at the Staten Island Quarantine.—In 1854, cholera passengers came to the vicinity of Lancaster, Pennsylvania; their clothes were sent to a high and healthy location at Lancaster; the relatives, who washed these articles, died of cholera. A sailor died in Europe of cholera in 1832; a chest containing his clothing was sent home to a small village in Maine, and was opened on arrival; the inmates of the house were suddenly seized with cholera and some of them died. The venerable Dr. Mussy, and Dr. Reade are responsible for the above.—At Guadaloupe, in 1865,

the whole country became infected from clothing which had been sent ashore from a Marseilles ship to be washed; and 10,806 died out of a population of 149,107.—Vomero, one of the most considerable heights at the back of Naples, is the residence of a great number of laundresses, where a large quantity of clothing is washed. Nineteen of these poor women were attacked in 1865, and five died. The height and healthy air of the Vomero seemed to preclude the possibility of cholera ascending to it, but it was discovered that the linen of some who had died, or been attacked by the malady, had been sent up there to be cleansed. A man who had recovered from cholera in 1865, sent his clothing to be washed in his native town of Rovegno, where no other cases of cholera occurred, except those of three women in his family who washed the clothing, all of whom died. A peasant perished in 1865 of cholera, not far from Marseilles, in an isolated place and his wife also. He had not visited Marseilles where the cholera prevailed, but his wife was a laundress and had received a bundle of linen from a person recently arrived from Egypt. The husband opened the bundle and unfolded all the pieces, which were defiled with cholera discharges. We may almost agree with Dr. Marsden, of Canada, that all clothing of cholera patients should be destroyed.

(*f.*) DISTRIBUTION BY MASSES OF FILTH.

Accumulations of offal of many kinds may excite disease similar to Asiatic cholera, but cannot originate the real malady unless true cholera filth has been introduced among them. There can be no question that the carelessness with which cholera evacuations are emptied into common privies, gutters, sewers, or upon heaps of manure, greatly promotes the sudden

and rapid extension of the disease, and causes most violent and fatal epidemics. There can be as little doubt that many of these disgusting masses are quickly converted by a species of fermentation into huge quantities of "cholera matter." During the Crimean war, in 1854 and 1855, the French troops, who came from Algeria, where cholera was devastating the country, had scarcely disembarked at Gallipolis, when the disease broke out among the people; thence it followed the French to Varna, where it decimated the inhabitants; then almost subsided. But immediately after the battle of the Alma, owing, it is believed, to the army halting for two days on the field, where hundreds of putrid carcasses of horses were scattered about, and the surface of the ground was polluted with ordure, from its occupation by the Russians, cholera, which had previously been in abeyance, increased with great rapidity; especially as the troops were greatly fatigued, their food indifferent, and the water scanty. From the Alma it was carried to the allied camps before Sebastopol, and caused great losses of men. Both the French and English fleets were also seriously affected.—At the outbreak of the disease in Wheeling, in the spring of 1833, the market-place was in a state of unprecedented filth; the mud, the sweepings of the market, and other impurities had accumulated to the depth of several inches over the whole square. Hard rains, succeeded by a hot sun, had beaten down the dirty mass and baked its surface into a firm, dry crust. A meeting of the common council was called to determine what should be done with this immense accumulation of filth, and the physicians who were consulted, advised that it should remain undisturbed until the disappearance of the epidemic. But this advice was disregarded, and the dirt was at once gathered into heaps and carted to the

edge of the river bank, a short distance off. The wind at the time blew directly in a line from the pile of dirt to a thickly settled part of the town; and between midnight and daylight of the next morning, nearly every member of two families, living in the house nearest to the new heap of filth was seized with cholera, and not less than three or four died. Other persons in adjoining houses, and in dwellings in the same row on the opposite side of the street, were attacked at nearly the same time; while all the houses fronting on the market square became the centre of a most fearful mortality. These few days constituted the greatest period of terror experienced during the epidemic in Wheeling, and Houston says the cause was too palpable not to be recognized by every one.—At Wakefield in England there are three prisons in one enclosure. One of these is near a sluggish stream on flat and marshy ground; the sewers of the prison run into it, and the water from the stream is pushed back at times into the drains, and the soil thus often becomes infiltrated with noxious fluids. The ventilation was also imperfect in this building. In the other two prisons the opposite condition prevailed; the ventilation was good, and the drains led outside the grounds. Cholera prevailed extensively in the first-mentioned establishment, and not in the latter; hence whatever be the cause of cholera, it is intensified and multiplied by insalubrious and foul emanations.—In 1849, cholera raged to *an almost* exterminating extent, in Reed street, Philadelphia, from the east side of Front street down to the Delaware. The dwellings were well built, and well ventilated, but a few yards only from the door of the last of these houses, the Reed-street culvert emptied its foul matter, and at its mouth was a morass of many acres, which at high tide was covered with water, and at low tide exposed to the rays of the

sun. The sewer drained a distance of ten squares or about half a mile; the county prison was cleared, as it is now, by this drain, of its entire filth, that of water closets included. The feculence which passed through this culvert was poured out on the marsh, underwent a festering putrefaction, and generated an atmosphere which had much to do in increasing the excessive mortality which marked the epidemic at this spot. These foul gases did not originate the cholera, but greatly intensified it in 1849. But in 1854, the culvert was extended to low-water mark, the morass was filled up and the drainage made complete; and Reed street, in the epidemic of that year, did not suffer more than other parts of the city.—The western side of Beyroot is usually more healthy than the eastern, but, in 1855, the refuse excrements of the city were transferred there; the cesspools of Beyroot run from the houses into receptacles in the streets, and their deposits are removed by a class of men called "zibbals," who carry away the filth in large panniers on the backs of donkeys to the dumping ground. Nearly all these men died of cholera, which also prevailed with much greater violence on the west side of the city, than on the east, which is low, marshy, the abode of fevers, and generally more unhealthful.

(*g.*) DISTRIBUTION BY SOIL.

Pettenkofer, of Munich, has paid much attention to the character of the soil and the quantity and quality of sub-soil water which favor the development of cholera; but, with little practical result, if one can form a judgment, after carefully perusing his work, twice, in the original text. He concludes that cholera is propagated by human intercourse, and never without this; not by contact with diseased persons, or their ex-

cretions; but by means of certain changes which the latter undergo after they have penetrated beneath the ground, when the soil is light and porous, *i. e.*, permeable to air and water; especially of sub-soil water, already impregnated with the products of organic decomposition, of excrementitious or fæcal origin, is present within a certain distance of the surface, say, within five or fifty feet. This filthy sub-soil water beneath habitations he regards as far more injurious than that of more or less distant marshes, or low banks of rivers. The germs of cholera are supposed to be contained in the discharges of cholera patients, but these do not become poisonous so as to reproduce the disease in others until they have penetrated through the earth down to the sub-soil water. The nearer this sub-soil water lies to the surface, and the more it is contaminated, previously, by drainage from cess-pools, sewers, privies, middens, &c., the more rapid and extensive will be the reproduction of cholera. There may be some little truth in this; but soil or earth is the best disinfectant, and when rain is poured copiously upon, and sinks down into it, it carries oxygen and dissolved air with it, and begins an action so extensive, that by it, we may say, nearly all the purification of the world is performed. But if rain falls and remains on or near the surface, it soon loses its oxygen, purification ceases, and vapors arising carry up some of the injurious gases with it. This is the case with marsh miasm; and if water does not flow freely beneath the soil by means of natural or artificial drains, the earth will not destroy the poison, which will be liberated in full strength when the ground is turned up. Hence, clay bottoms and rocks a small distance beneath the surface may retain moisture enough to cause disease; but light porous soils will prevent it. The principal

proof which Pettenkofer produces in favor of his theory, is the freedom of the city of Wurzburg from cholera, which never has been able to attain a foothold there. Wurzburg lies high on a hill, all the sewers are hewn out of solid rock, or built of water-tight masonry, and run from ten to seventeen feet below the surface. The privies and their connections with the sewers are built of stone; much of the water which falls on the roofs of houses is conducted down into the privies and flushes them into the sewers. The drains all empty into the river Maine, which has rocky banks, at least ten feet high, and its stream is rapid. Hence no impurity remains in houses or streets; all is carried off by the river. The court-yards of the houses are paved with flagging; hence nothing soaks into the earth from them. Of course, Wurzburg remains and will remain free from cholera; it is a veritable place of refuge from it. Of all other cities, where Pettenkofer dwells about soil and sub-soil water, we have a record of disgusting surface filth; foul, unpaved court-yards; low grounds, saturated with offensive drainage from above; offensive privies, unsupplied with water; noisome drains running directly under the side-walks, and only scantily covered with loose boards; filthy "street-side conveniences;" of manure heaps in back yards, where human ordure is cast from numerous houses which have no privies at all; and of the general use of wooden tubs for water-closets. If these feculent things were rectified, soil and sub-soil water might be safely ignored; it is scarcely necessary to look under the earth for minor evils, when such abominable nuisances obtrude on the surface and offend both eyes and nose at every step and breath.

I feel no inclination to close this chapter without some notice of the strongest arguments of those who maintain differ-

ent views ; and will at once give several in addition. 1st. As regards the diffusion of cholera by the air, I call attention to the fact, that a putrid organic liquid can be obtained from the atmosphere of an unclean place, by passing it through a tube artificially cooled. The same may well happen with the filthy air of Bengal and other cholera haunts. But gases soon become diluted by mixture with air, and harmless. Marsh miasm which cannot enter the closed windows of one side of the house, may become so weak before it can creep around to the other, where the windows are open, that no injury ensues. 2d. A heavy fall of rain often stops cholera, and we know that rain thoroughly washes the air of all its impurities. 3d. A violent thunder-storm also prevents cholera, and we know that lightning absolutely seems to burn up all impurities of the air, as flax is burnt in fire. Still, I feel confident that the poison of cholera originates from filthy men and places on the surface of the earth, and that cleanliness and disinfection will prevent all contamination of the atmosphere ; and that even if cholera be introduced into a place, cleanliness and disinfection will check it promptly. 4th. Dr. Vandeveer, in his account of the Franklin street cholera hospital, says that each ward, twenty-five feet by thirty, generally contained twenty-five patients. Physicians, nurses, and attendants, to the number of twenty, occupied adjoining rooms, with free communication and doors frequently open. Post-mortem examinations, to the number of seventy-eight, were made, and the hands of the physicians were freely bathed in the cholera fluids ; the dead, for want of rapid transportation, were sometimes piled in coffins, one on top of the other, to the number of ten or twelve. Yet only one of the physicians and nurses was attacked with cholera. Bnt in the recent epidemic at

Ancona, fourteen physicians lost their lives, and the Sisters of Charity were decimated. 5th. Great stress is laid upon the fact, that a man in Munich, while in a state of intoxication, drank a large beerglassful of the rice-water-vomit of a cholera patient without subsequent injury; and that some of the physicians of Munich freely tasted, and even swallowed, cholera discharges with like impunity. But, there is a well-authenticated case in which a Parisian dog devoured a large quantity of the alvine dejections of a cholera patient, and died with all the symptoms of the disease; and Dr. Robin has injected rice-water-vomits and the thinner portions of the blood of cholera patients into the windpipes of healthy dogs, and found them to produce vomiting, liquid evacuations, chills, and speedy death. 6th. Persons have slept in the beds, and worn the clothes previously used by cholera patients, and even suffered agonies of childish fear for many weeks subsequently, and yet have not contracted the disease; others have died from similar imprudence or folly. From eighty-four communications about washerwomen, Bally and Gull concluded that they were not much more subject to the disease than others. We should recollect, in this connection, that the number of careful and cleanly persons liable to cholera is always very small; it has been variously estimated from thirty-seven to sixty-one, at the lowest, and five hundred and thirty-five, in ten thousand, at the highest. The susceptibility varies so much, that one may die from eating a few cherries; on the other hand, during the last epidemic, in a small town in Kentucky, nine young men employed themselves in nursing the sick and burying the dead, and as melons were in season and abundant, they all ate freely of them the whole time, and none of them suffered with any symptom of the disease,

a'though a large number of the inhabitants were attacked. Dr. Salisbury even thinks that cider, sulphur-water, and certain classes of ripe fruit and vegetables, are preventives of epidemic cholera. Again, Dr. Houston, who does not believe in the communicability of cholera, cites his experience at Bridgeport, near Wheeling; it contained only two or three hundred inhabitants, was situated on an island; but more or *less* communication was kept up with Wheeling by means of ferry-boats, and the place was very filthy. The disease commenced in Wheeling about the 15th of May, and did not appear in Bridgeport until the last week in June, or, in about five weeks; then it broke out in the night, and in thirty-six hours not less than twenty-two of the inhabitants had fallen its victims. But, cholera is always preceded by diarrhœa and cholerine, and it may be days or weeks before real cases of cholera show themselves. Again, in the Massachusetts state-prison, in 1832, the first case of cholera occurred in a man under solitary confinement; in the course of an hour four more were attacked in different remote parts of the prison, and in the space of forty-eight hours, two hundred and five inmates of the building had the disease. It is said, triumphantly, "This certainly does not look like contagion." But it does. Cholerine had certainly been at work in that prison, silently but efficiently, until an explosion took place. I have intentionally cited the apparently sudden outbreak in Constantinople in 1865, but in every case it was traced to importation; and excessive filth furnished the other factor of a sudden outbreak. In proof of the above, it is sufficient to cite the conclusions of Jules Guerin, which are now generally adopted by the profession, to prove that the causes of cholera must have been at work in Bridgeport and in the Massachu-

setts state-prison long before the outbreak, and that the persons who imported it had escaped observation. Previous to 1832, it was supposed that cholera attacked its victims in a very sudden manner; but Jules Guerin first noticed that most of the cholera subjects had been laboring for several days, or even weeks, under a disturbed condition of the digestive organs, which did not appear sufficiently serious to deserve careful attention. Some were so careless upon this point, that they could only give a satisfactory answer after having been questioned three or four times. Of six hundred patients, five hundred and forty had shown symptoms of cholerine, or premonitory diarrhœa; of five hundred other subjects, almost all had been previously attacked by choleraic diarrhœa of ten or twelve days' duration; and the rice-water discharges were always preceded by others of a different, though unhealthy character. Of three thousand nine hundred and two additional cases, not one was found without prodromic diarrhœa; of one hundred and forty-two more, there were only six without preceding symptoms; in ninety-five other cases, the diarrhœa had lasted two, three, four, and even a greater number of days; of nine hundred and seventy-four cholera patients, seven hundred and forty had been attacked with premonitory diarrhœa, and the rest were exempt, or unable to give exact evidence. Jackson's case, in which the disease is stated to have suddenly occurred in a neighborhood, twenty-six miles from Philadelphia, and where the only person who had been in the city when cholera prevailed, and who might be supposed to have carried the contagion, escaped, proves nothing; except, that this or some other person doubtless did bring the disorder, in the shape of cholerine, and that other more susceptible individuals suffered far more severely

than the one who imported it. We all know what severe attacks of scarlet fever and measles may follow exposure to persons who have either been very slightly sick themselves, or have apparently entirely recovered, so as to be able to go to business, school, or church.—Finally, the apparently sudden and extensive outbreak which cholera sometimes makes, does not accord, it is supposed by some, with the slow and gradual spread which the disease ought only to advance, if it arose by contact from person to person. But we have seen that the seeds of cholera are always sown slowly, although the outbreak may seem sudden. Besides, the communicability of the disease does not correspond with the time when the dejections are voided; but is only developed a few days subsequently, and seems to be exhausted at the end of fifteen to twenty-one days. This peculiarity has been traced to the fact that the rice-water discharges only become poisonous after a while; for the first few days they are innocuous; then, as decomposition proceeds they become morbific, and capable of re-producing the peculiar disease of which they were the product. And still more strangely, after a few days more, when decomposition has reached a farther stage, the contagious property of the evacuations cease. These great facts account for the impunity with which careful and cleanly persons may wait upon those sick with cholera; for the mysterious and sudden outbreak of the disease, and for its equally sudden subsidence. These points have been proved, in the following ingenious way: pieces of filtering paper, soaked in the rice-water discharges have been given to mice, mixed with their food, and it was found that papers steeped in the very recent, and others dipped in the older discharges, proved alike harmless. But of thirty-four mice that ate papers impregnated with excre-

tæ of an intermediate date, thirty became sick, and twelve died; while the symptoms and appearances noticed after death, are declared to have been similar to those that are proper to cholera as it is seen in the human subject.

The sudden cessation of cholera is often cited as a proof that it depends, not on contagion, but upon some general influence in the air, which is blown upon us like a whirlwind, rages as destructively, and ceases as suddenly. But, if the process by which cholera discharges become poisonous ceases spontaneously in a few days or weeks, the epidemic must die out in the places where it first originated as suddenly as it commenced, although it may spread to other parts of the same city or country.

NATURE.

It may reasonably be inferred, from all that has gone before, that the poison of cholera is somewhat similar to that which arises from offensive sewers and privies, and to which night-scavengers are subject until they become acclimated. In fact, it somewhat resembles the so-called *septic cholera*, which was formerly best seem in the new visitants to the old-fashioned, badly ventilated and equipped dissecting rooms. In former times very few medical students escaped; the symptoms were a profuse diarrhœa with but little pain, followed by quick exhaustion; the discharges were thin, like dirty soap-water, without flocculi, shreds, or bile; there was some nausea, but not often severe vomiting. Or, cholera is comparable to the sewer-disease, of which cases enough are to be found in this city, but of which Naples sometimes furnishes pregnant examples. In Naples, the public drains empty themselves on the sands in front of the Villa Reale, which is the most fashionable promenade; heavy rains often flood the streets and flush the sewers and sluices of their accumulated abominations down to the sands and the sea. The waves and surf frequently drive these back, again and again, on the shore; while the winds rushing up the open culverts force back the fetid gases through the rain openings in the street, and through the open water-closets into the houses, so that the smell through the entire lower part of the city is often awful, and a considerable portion of the population may be suddenly affected with nausea, colic, diarrhœa, and even dysentery.—Watson records the sudden outbreak of a violent disorder, a sort of cholera, among the boys in a large school at Clapham; nearly a score of them were all at once attacked with the most alarming symp-

toms, and two of them died, in consequence of the opening of an old cesspool behind the house, and the distribution of its foul contents over a garden adjoining their play-ground. Subsequently two hundred and ten out of four hundred and twenty inmates were affected, and it was found that the drainage of the building was imperfect, the sinks and water-closets not properly trapped, and an old drain under the house was choked. It was then recollected that there had been a strong sewage smell in some of the rooms before the outbreak. The first case reported as Asiatic cholera this year (1866) in New York was doubtless one of septic cholera. We learn that Mrs. Jenkins, aged thirty-five, had been engaged for some days, and at the time of her attack, in removing the contents of an old privy and spreading them as a fertilizer upon a lot of ground, in order to raise a crop of potatoes. She sickened May 1st, at ten A. M., and died in twenty hours; the post-mortem examination revealed lesions similar to those of Asiatic cholera. Although the cellar of the house was partially filled with stagnant water, and the remainder of the building was filthy, and four other families lived in it, no one else sickened or died; showing that it required the concentrated power of the fæcal emanations to produce a fatal attack.

Dr. Read, of Boston, believes that there are three diseases, or varieties of cholera, very much resembling each other, each of them capable of producing a fatal result, but radically different. All of them are characterized by excessive action of the alimentary canal, and in proportion as the attacks increase in intensity, may bring out the peculiar features of collapse, viz., the cold, clammy, wet, blue skin; the pinched features; husky and often sepulchral voice, and the cramps in the limbs. They are each dependent on different and peculiar

exciting causes. The first, is the *septic cholera*, or that arising from exposure to poisonous gases; second, common cholera, or *cholera morbus*, or endemic hepatic cholera; and third, the epidemic-intestinal, or true Asiatic cholera. The first, he assumes, affects those who are exposed to animal effluvia, whether from dissecting-rooms, or abattoirs, offensive privies and sewers, or noxious gases in general. The second arises from a bilious condition; or use of improper food in the summer time, such as unripe melons, cucumbers, cherries, spoiled crabs, lobsters, fish, &c.; or from sudden changes of temperature, causing a check of perspiration; or frequently from all these causes combined. These two are not contagious in the slightest degree, nor capable of being generated except by the operation of the original exciting causes. In the case of Mrs. Jenkins, in New York, he also sees no reasons for looking beyond septic cholera, for the cause of sickness and death, for she was attacked as many persons engaged in removing night-soil are, when they first begin this occupation and, are not inured to the sickening, filthy odors which then assail them. In the Home for Aged Females in Boston, twenty-seven of the inmates were attacked in 1865, in one night, with septic cholera, but only one died. In Edinburgh this form of cholera is not uncommon; the water supply is good, and brought from a distance in pipes, and not contaminated by sewage; wells and pumps are not used. The street dirt, and all that is offensive is removed, once or twice daily, by an efficient corps of scavengers, so that large profits are realized by the sale of street manure. But the sewerage is inadequate, and the water-closets, except a few that are well constructed and trapped, are often noxious and most disgusting nuisances, and insidious sources

of disease, owing to the ascent of noxious gases from the sewers, for which they act as ventilators. This is prevented, in some cases, by conducting pipes from below the traps up above the roofs of the houses. Dr. Read has neglected to include cholera infantum among the diseases which resemble, and may be suddenly changed into, true cholera. It is well known that in "cholera times" the first cases are often noticed among infants. In fact, the name of cholera is given to any complaint in which the prominent characters are simultaneous and repeated vomiting and purging, with painful spasms of the stomach and bowels, and occasional cramps of the external muscles; and true Asiatic cholera may ally itself to all these. Five varieties have been observed, so different in the circumstances of their occurrence, as well as in their symptoms, progress, and results, as to merit distinct consideration. These are: first, *cholera morbus;* second, *septic cholera;* third, *bilious cholera;* fourth, *cholera infantum;* and fifth, *Asiatic cholera.*

1. CHOLERA MORBUS.

Hot weather, long continued, strongly predisposes the system to cholera morbus, and may itself occasion the disease, without any other cause. Wood says the same may be said of marsh miasmata, for it often precedes the breaking out of miasmatic fevers, as if from the operation of the same cause. Most commonly, however, the immediate attack is brought on by some well-known exciting cause, such as exposure to cold when the body is heated and perspiring; the use of certain indigestible and irritating articles of food or drink, such as cucumbers, melons, various unripe fruits, fat pork, lobsters, crabs, sour and incompletely fer-

mented liquors, putrid water, excesses at table, and the use of ice or very cold drinks in excess. Wood has seen the operation of *calomel* in some instances so exactly like cholera morbus, that the most experienced physician could scarcely distinguish them. In cholera morbus the pulse is usually feeble, countenance pale and shrunken, skin cool and damp, urine scanty or suppressed; and in some cases there are often very painful cramps of the muscles of the abdomen and legs. The vomiting and purging may become almost incessant, extremities cold, and extreme exhaustion occur. The vomits may become colorless after a while, but often are sour or acrid. In some instances, when all the indigestible and ordinary fœcal and biliary matters have passed off, the evacuations may become colorless or whitish, as in epidemic cholera. When true cholera prevails, this disease may be rapidly transformed into it. Lankester thinks that a certain amount of the diarrhœa and cholera morbus of summer may be attributed to the decomposition of animal and vegetable matters, which are directly taken into the stomach in the shape of stale, spoiled, or partly decomposed vegetables and meats. They cause a like corruption of the rest of the intestinal contents, and form a fit nidus for the development of true cholera.

2. BILIOUS CHOLERA.

Watson says, there is a complaint of which diarrhœa is one prominent symptom, but which is something more than mere diarrhœa; it occurs in England and in this country, more or less, every autumn or summer. It is rightly enough called cholera, for it is attended with, and consists mainly, of a remarkable flux of bile. The symptoms are vomiting and purging of liquid matter, deeply tinged with and principally com-

posed of bile; violent pains in the stomach and bowels; cramps of the legs and abdominal muscles; great depression of the vital power, and a tendency to syncope or collapse. The attack is generally sudden; at first the contents of the alimentary canal are evacuated; and then a quantity, an enormous quantity sometimes, of a turbid, yellowish, acrid fluid is expelled with violence, both from the bowels and by vomiting. As the vomiting and purging go on, clonic spasms of the legs, especially of the calves, occur; the surface of the belly is drawn up into knots and after a while the patient exhausted by the pain and spasms, and still more by the copious discharges, grows cold and faint. Actual syncope sometimes happens, and occasionally death, but rarely.

3. CHOLERA INFANTUM.

This disease occurs in all our largest cities, during the season of greatest heat, attacking children between four and twenty months of age. The first symptom is usually a profuse diarrhœa, the stools being very fluid, and generally of a very light color, though often curdled, or pale yellow or green. To the diarrhœa is soon added extreme irritability of the stomach. After a while the discharges are often composed entirely of a perfectly colorless and inodorous fluid, containing minute mucous flocculi, and discharged without effort. It is produced by the action of a heated, impure, damp, and stagnant atmosphere, directly upon the lungs and blood, and indirectly upon the skin, and digestive mucous surface; it becomes more frequent and fatal with the rise of the thermometer, and declines with the first appearance of cool weather in the autumn. The worst cases occur among the children of the poorer classes, inhabiting small, damp, and ill-

ventilated houses, in narrow confined lanes, courts, and alleys, or in situations abounding with accumulations of filth. In all cases the cure will depend very much upon our ability to remove the patient from the influence of the impure, damp, and heated atmosphere, by which the disease is kept up.

4. ASIATIC CHOLERA.

Omitting for the present the consideration of cholerine, or premonitory diarrhœa, we turn our attention to the characteristic phenomena and the nature of Asiatic cholera. The choleraic diarrhœa is attended with very little pain, showing great torpor of the nerves; soon the bowels act by the stimulus of distension alone, as there is a paralytic condition of their muscular coat, and the dejections become frequent and copious, and pass off in a full stream with very little effort. They quickly become watery and serous, and at last present that appearance which has by common consent been called *rice-water*. They resemble this more than anything else, and are composed exclusively of the serum or watery part of the blood, intermingled with an immense amount of epithelium and some flakes from the mucous membrane.

After a shorter or longer period of diarrhœa, suddenly, without much nausea, *vomiting* commences, of a similar watery fluid to that discharged from the bowels. The skin also becomes covered with a cold clammy *sweat*, which at times is very profuse. Condie justly remarks, that this copious *perspiration* is generally not dwelt upon with sufficient emphasis for it is a source of great exhaustion; it sets in early in the attack, and becomes excessive towards the close of fatal cases.

In consequence of this drain of fluids from the system, in-

tense *thirst* is experienced, and seems to prevail in direct ratio to the quantity of watery fluid which has been poured out by the discharges, and to depend on them. It is based upon an instinctive desire and urgent demand for a supply of fluid to make up the waste and drain from the system. Condie has even known patients attempt to allay it by swallowing the fluids they had just before vomited, if they could get no other drink.

The loss of fluids is so great that the whole body shrinks; the features become contracted and pinched; the hands and feet are shrivelled, corrugated, and greatly shrunken, and lose at least one third of their bulk.

When much serum has been poured out, the blood becomes so thick that it no longer traverses its accustomed rounds with facility, but collects in undue quantity in the right side of the heart, in the vena cava, in the portal and emulgent veins. In fact, the whole venous system is found turgid with black, coagulated blood. In twenty cases in which cholera-blood was left to stand for some time, not one drop of serum separated from it.

The *thickness of the blood* is such that it does not flow in the usual channels which expose so great a surface to the action of the air, throughout the minute and abundant capillaries of the lungs. Air enters the lungs, but respiration is laborious, and attended with a sense of suffocation from the changed condition of the blood, that resists the full vivifying influence of the air upon it. Ultimately, the proper changes of the blood in the lungs, from merely being imperfectly effected, are entirely suspended; and that portion which reaches the left or arterial side of the heart, becomes similar to that sent to the lungs from the right, or venous side. The propulsive

power of the heart soon becomes enfeebled; the general circulation almost suspended; and the dark color of the blood produces a blue or bronzed hue of those parts in which the thinness of the skin permits its color to be seen.

The circulation being almost suspended, animal heat can no longer be generated in sufficient quantities, and the body becomes not only blue, but cold.

The most painful and distressing phenomena of this destructive malady, viz., the cramps and spasms, are ushered in almost simultaneously with these profuse evacuations from the stomach, bowels, and skin, and apparently are intimately connected with them. At times a similar spasmodic irritation extends to the heart and arteries, and the pulse instead of becoming soft and feeble, may be hard and wiry, while the heart struggles violently.

Finally, collapse occurs; the watery evacuations and spasms cease, and the patient lies indifferent, apathetic, fearless, and only craves for drink.

THEORIES.

(*a.*) PHYSIOLOGICAL THEORY.

COMPARATIVELY late discoveries in physiology make it quite plain how easily the immense quantities of fluid discharged in the evacuations of cholera can take place. The normal quantity of water poured out daily and hourly by the mucous membranes is very great. If we turn down the lower lip before a mirror, and wipe it quite dry, we may see and feel a number of seed-like little glands studding the surface all over. In a few moments each one of the protuberances will be headed by a tiny drop of dew, which grows rapidly larger, till, in a short time, the whole lip is covered with moisture as before. Reckoning the extent of the gastro-intestinal mucous surface at twenty-four square feet, the square inch we were looking at must be multiplied by 3,456 to get a correct idea of this great secreting surface. The immense amount of water poured out daily, by the mucous membrane of the stomach and bowels, is not naturally destined to be wasted; but in cholera it is. In health we see how quickly it exudes, and we know by the amount of our fæces, in the normal state, that it does not naturally pass off by the bowels into which it is thrown. What becomes of the several gallons a-day which is secreted from this active source? We know that however well the mucous membrane may be constructed for purposes of *secretion*, it is still better constructed for *absorption;* that water, however quickly it is supplied, will be rapidly taken up, and is absorbed, indeed, with a rapidity very closely proportioned to its quantity. The intestinal canal naturally drinks up not only the fluids which we swallow as food, but also those which it

pours out so copiously for its own digestive processes. What the amount of these is will best be seen by a tabular sketch of the probable (say maximum) quantities of each secretion poured out directly or indirectly from the gastro-intestinal mucous membrane. An adult man is calculated to secrete in twenty-four hours, weights approaching nearly to the undermentioned: Of saliva, three to four pounds, avoirdupois; of bile, three to four pounds; of gastric juice, fourteen to sixteen pounds; of pancreatic juice, half a pound; of intestinal juice, half a pound; thus making a grand total of from twenty-one to twenty-five pounds of fluid; of which only so much passes away from the bowels normally, as will prevent the fæces from becoming too solid.

The clearest notion we can gain of the business performed by all this ten or twelve quarts of water which naturally exude on the mucous membrane of the intestinal canal, and should be taken up by the same membrane again, is by viewing it as a *circulation*. In health, it is constantly going its rounds like an endless chain, finding and taking up inside the solid structure of the body substances which ought to come out, and be got rid of; and meeting in the alimentary canal with nutriment which the body wants, and conveying it in. In cholera this immense exudation takes place, but almost all absorption is stopped; consequently, profuse liquid, serous, or almost white discharges must occur.

The appearances in the stomach and bowels after death are thought to accord with this view of the disease, The stomach often only presents a pale or yellowish appearance; or scarcely any change, except, that it is somewhat contracted and thickened. The small intestines are frequently found pale and œdematous. But the most common

alteration consist in an enlargement of the solitary glands, from a serous fluid or granular matter deposited in them. The epithelium which naturally covers the mucous membrane, is always found partially or wholly removed. These are justly regarded as the great pathological features of cholera. As the epithelium is everywhere remarkably endosmotic, the removal of so much of it must interfere greatly with absorption; and as the villi are the principal agents of absorption of the nutritive elements resulting from the digestion of food, their functions must be much impeded by the removal of their covering epithelium. As the intestinal glands are greatly enlarged, they probably pour out a much greater quantity of fluid than natural.

It is rational to suppose that all the essential elements of a true theory of cholera are contained in the above well-authenticated facts, and that all the phenomena of the disease can be explained by them. Thus Dr. Snow has computed that, in a healthy adult of average size, it is only necessary that five pints of serous fluid should be poured out, in order to reduce the blood to the condition that obtains in the collapse of cholera. In the less acute cases, where the evacuations exceed the above quantity, he infers that some of the fluids drank pass off by the bowels; or assumes correctly that absorption is not altogether suspended; experiments having shown that absorption, although diminished in attack of cholera, does not always cease; for iodide of potassium, administered during the algid stage, has sometimes been detected in the blood and urine.

The indications of treatment, according to this view, are to use *tonic astringents*, especially iron alum, sulphate of

iron, simple alum, gallic acid, muriate tincture of iron, elixir vitriol, sulphuric acid, &c.

(b.) GLAND THEORY.

As the solitary glands of the intestinal canal are very much enlarged in cholera, so as to be very distinct and prominent, causing the surface of the bowel to resemble a nutmeg-grater in roughness; and as the glands of Peyer are also, in most cases, exceedingly distinct and conspicuous, so that the inner wall of the intestines seems fretted with separate or aggregated granular protuberances, Dr. Isaac Hayes has selected these facts for the formation of a theory of cholera. He thinks the first step in the disease is an orgasm of these follicles; they increase in size, and their secretions are augmented in the same way that that of the mammary glands is. He infers that this exaggerated exudation from the follicles has been preceded by an active flux towards them, and by that state of turgescence of the secretory organs which is an attendant upon most augmented exhalations. Thus is caused the serous diarrhœa, which is the first stage of cholera, and which quickly drains from the blood a large portion of its white fluid or serum, and the saline matter which it holds in solution. As soon as this has gone on for a while, the peculiar choleraic symptoms appear, such as debility, coldness of the extremities, feebleness of the pulse, and oppressed respiration, which are the immediate results of all sudden losses of blood. Next, the blood, deprived of its serum by the profuse discharges from the bowels, becomes thickened, and in proportion as it is rendered viscid, the propulsive power of the heart is enfeebled, and the circu-

lation is diminished. Less blood is carried to the lungs, and the respiration becomes embarrassed; the oxygen of the inspired air cannot effect those changes which it ordinarily produces, and more carbonic acid is retained. Finally, all the blood becomes venous, and the symptoms of cholera asphyxia arise. This view is almost as satisfactory as the physiological one we have already given.

The indications of treatment, according to this theory—which is based on the well-known law, *ubi irritatio, ibi fluxus*—are to use *sedative astringents*, such as opium, acetate of lead, digitalis, &c.

(c.) ELIMINATION THEORY.

Dr. George Johnson, and many other physicians, believe that the cholera stools contain some poisonous materials, by which the disease is not only multiplied in the human system, but can be communicated to others; and assume that it is also probable that the discharges into the digestive canal, together with the vomiting and purging, are as much parts of the natural process of cure as is the eruption on the skin in small-pox. They oppose the commonly-received opinion that the worst symptoms of cholera are mainly due to the drain of serum from the blood by the vomiting and purging. They say if this theory be erroneous, it is of incalculable importance that it should be discarded; for it is unquestionable that it has had an immense influence on the treatment of cholera, as well as on the estimate which men have formed of the effect of various modes of treatment. Let a practitioner be thoroughly persuaded that the essential cause of choleraic collapse is a drain of liquid from the blood, and it will be difficult to convince him that opium and astringents

can do harm, or that emetics or purgatives can do good. The symptoms of cholera result from a poison which may enter the blood either through the lungs, or by way of the gastro-intestinal canal, and its most constant and characteristic effect is to excite a copious excretion from the mucous membrane of the stomach and bowels. Vomiting and purging constitute the means by which the morbid particles are removed from the blood and alimentary canal. Hence the process of elimination takes place by two successive stages. First, there is an excretion of fluid from the blood into the stomach and bowels; and second, the morbid contents of these viscera are ejected by vomiting and purging. Johnson asks: Can we do anything to assist the natural process? and answers, unquestionably we can, by emetics and purgatives. A purgative may be useful by removing two conditions which often obtain in cholera, viz., over distention of the bowels by liquid; and an accumulation of offensive viscid and semi-solid secretions.

Johnson gives mild emetics and copious draughts of plain or salt water; but prefers castor oil as a laxative, because he thinks the object of a purgative is not to remove the poison from the blood and increase excretion into the stomach and bowels; but simply to expel the morbid secretions which have already been poured out into the alimentary canal. Wilson prefers charcoal, from its controlling and corrective power over all ferments, acescent and putrefactive. He believes that foul, morbid fermentation in the stomach and bowels is one of the most constant attendants, and not the least of aggravating causes, in the progression of the disease; for he invariably found, in post-mortem examinations, notwithstanding the gallons of watery fluid which had passed

off, that the contents of the bowels were most offensively feculent. After using this remedy a few days, he gave a dose of oil, in order to remove the accumulated charcoal and the putrid matter it had absorbed; for he found, until he did so, his cases of relapse were frequent, and sometimes fatal. Billings prefers epsom salts and tartar emetic; Jephson, large doses of croton oil. The homœopathists rely upon ipecac., tobacco, veratrum, hellebore, tartar emetic, mercury, &c.

(*d.*) PARALYSIS THEORY.

In many or most cases of cholera, the bowels are said to act one or more times largely, and then all power of absorption from the stomach and bowels is supposed to be gone. The vessels and nerves which preside over absorption are inferred to be *paralyzed*, and, by continuity, this paralytic condition is thought to extend to the ganglionic or great sympathetic nervous system, which governs and regulates capillary circulation everywhere, but more particularly in the alimentary canal. This paralysis of the nerves and capillaries allows the blood to become drained of its serum and saline particles, just as an exhausting perspiration occurs from a debilitated skin.

When the poison of cholera first obtains entrance into the body by being inhaled into the air tubes, it is assumed that the great gastro-pulmonary or pneumo-gastric nerve becomes wholly or partially *paralyzed*. Then the air which is drawn into the lungs is expelled again in the same state in which it was taken in, except that it has been exposed for a short time to a moist animal surface; the air remains cold, and there is no elimination of carbon from the lungs, so that this essential part of respiration is in abeyance; little or no oxygen is in-

troduced into the system, and the symptoms of asphyxia arise. The blood becomes black and venous, and the skin assumes a blue color, although the muscles of respiration continue and even increase their action. The breathing is almost always doubled in frequency, rising from sixteen or eighteen to twenty-eight or thirty-four per minute; still it is almost always costal, and the oppression of the chest may be great.

The indications of treatment, according to this theory, are to use *tonics* and *stimulants*, such as strychnine, nux vomica, veratrine, ammonia, camphor, phosphorus, phosphoric acid, alcoholic stimulants, quinine, &c.

(*e.*) FIRST SPASM THEORY.

This commences with the assumption that the cholera poison is generally inhaled from the atmosphere into the lungs, thence passes into the blood, and that it is *irritant* in its nature, as is shown by the painful cramps which it subsequently occasions in the muscular tissues. This poisoned blood excites spasmodic contraction of the muscular walls of *the minute pulmonary arteries;* the effect of which is to diminish and, in fatal cases, entirely to arrest the flow of blood through the lungs. In the first and second stages of cholera, it is assumed, without sufficient proof, that there is a surprising contrast between the almost constant presence of an extremely *anæmic* or bloodless condition of the lungs, from which scarcely even a few drops of blood will flow when the tissue is cut, and the *hyperæmic* or congested state of all other organs. The passage of blood through the lungs, from the right to the left side of the heart, is said to be in a greater or less degree impeded; for, in the large majority of cases, in the earlier stages of cholera, the right side of the heart and the pulmonary arteries are filled, and sometimes distended with blood; while the left

cavities of the heart generally contain only a small quantity. The arteries are so empty that vessels of considerable size have been opened without the escape of blood, as has been done both to the temporal and brachial arteries during life. Johnson thinks this condition of things arises not from arrest of blood in the capillaries, but from *spasm* in the branches of the pulmonary artery, before the capillaries are reached by the blood. He says, we know that the walls of the arteries are muscular, and have the power of contracting on their contents under the influence of a stimulus, such as cold, electricity, and mechanical irritation, and that no physiologist of the present day will deny that *spasm of the arteries* is as real a fact as spasm of the muscles. He assumes that arrest of the blood in its passage to the lungs is the true key to the pathology of choleraic collapse, and one which will account for all the most striking chemical phenomena of the disease in a simple yet complete manner, viz., for the imperfect aeration of the blood, the fall of temperature, the dark and thickened appearance of the blood, and the suppression of the bile and urine. He says it is obvious that the stream of blood from the pulmonary capillaries to the left side of the heart is the channel by which the supply of oxygen is introduced into the system; and a great diminution in the volume of this will lessen the supply of oxygen in a corresponding degree. Again, the combustion of those constituents of the blood which are normally subjected to the action of oxygen will be diminished in proportion to the deficiency of that gas. The constituents of bile, urine, and carbonic acid, are all results of oxidation, and none of them can be formed without a large supply of oxygen; hence suppression of bile and urine during the stage of collapse is a necessary consequence. The amount of carbonic

acid expired during collapse is also much diminished; and, consequently, an excess is retained, not only in the lungs, but in the system in general. Plausible as this and the subsequent theory may appear at first sight, we can scarcely believe that they will be found consistent in all their parts, or to afford a a satisfactory explanation of the leading phenomena of cholera, or to serve as a safe basis for its rational and successful treatment. They seem to account for cholera asphyxia rather than the colliquative form, and are much less satisfactory than the physiological explanation.

If this theory be true, I would suggest the use of *conia*, or the active principle of the conium maculatum, for it produces a rapidly-increasing *paralysis*, first of the voluntary, then of the respiratory muscles of the chest and abdomen, and finally, of the spinal marrow. Acetate of lead will probably prove the next most useful remedy.

(*f.*) SECOND SPASM THEORY.

Bell and Braithwaite adopt a somewhat different spasm theory. They think the subtile poison of cholera acts primarily through the blood, and specifically upon the pneumo-gastric nerve, and subsequently on the great sympathetic nerve, which supplies contractile power to the arteries, intestinal canal, and organs of respiration. A kind of *tetanic contraction* is produced of all the arteries, thus emptying the contents of all the capillaries into the great central veins. Braithwaite says we all know how small a portion of *strychnine* will act on the voluntary muscles, and asks why a similar effect should not be caused by the virulent poison of cholera, but on rather different parts of the nervous and muscular systems from those specifically acted upon by *strychnine*. He accounts for the

intestinal phenomena of cholera by assuming that the portal circulation is at first impeded by meeting the reflux current from the vena cava, and presently becomes reversed, so that the blood is forced back into the mesenteric veins, till it distends their extreme ramifications upon the mucous membrane of the bowels, where its watery portions find a species of vent, just as dropsy takes place from obstruction in the heart, liver, or kidneys; from this surface the repellant force squeezes out the serous or watery portion of the blood, carrying with it the mucous epithelium, thus constituting those serous or rice-water evacuations which are regarded as characteristic of cholera. These are declared not to be real secretions, but mechanical effusions or exudations, which are quite the reverse of vital actions. The kidneys also become mechanically congested, the returning current of blood from the kidneys is stopped, and a first effect of this is a cessation of the secretion of urine. The hepatic circulation is affected in like manner, thus suspending or impeding the secretion of bile.

Bell assumes that the so-called collapse of cholera is different from the collapse of hæmorrhage; the first is active or dynamic, while the latter is passive or adynamic; the pulse in hæmorrhage becomes slower, softer, and feebler, till it ceases, but in cholera it is contracted, small, and wiry, as long as it can be felt. The heart in cholera is heard and felt to be struggling in an extraordinary state of excitement, and in the active endeavor to overcome spasmodic obstruction, it is found to be churning as if it would burst, causing a sound which it is difficult to describe, but which once heard can never be forgotten.

The first indication, according to this theory, is to *bleed.* When the sound and action of the heart convey the impres-

sion that it is laboring hard with unabated vigor of reaction, Bell thinks the lancet cannot be used too promptly. But when the attack has lasted four or five hours, and the purging is less copious, and the heart, instead of keeping up a continuous struggle, appears to be roused up to reaction at intervals only, then withhold the lancet awhile. If there is a decided renewal of distress, bleed again, till the thick tarry blood that at first could only be squeezed out and kneaded from the arm with difficulty, flows freely from the orifice and changes to a fair florid hue. Braithwaite relies mainly upon the inhalation of chloroform to overcome the spasm of the capillaries. Opium, assafœtida, and antispasmodics, belladonna, conium, and especially *conia*, should prove useful remedies.

It seems perfectly transparent that Johnson, Bell, and Braithwaite, have mistaken the secondary spasm of the pulmonary arteries, vascular system in general, and of the heart, for a primary disorder. (See page 80, line 12.)

(*g.*) CONGESTION THEORY.

George Hamilton infers that profound *passive congestion* is obviously present in nearly every violent attack, as is evident from the coldness of the extremities, ears, nose, and sometimes of the tongue; the purple color of these parts, and small feeble pulse. The congestion of cholera is of too much significance, he thinks, to attempt to sever its connection, however obscure, with the exhausting serous discharges. As long as the heart, lungs, and spinal marrow, remain passively congested, so long must almost every portion of the organism partake of this condition. The blood in the arteries becomes almost identical in its dark and carbonized appearance with that contained in the veins.

The first indication is to produce reaction of the vascular system, restore a normal fluid to the arterial system, and thus replace lost nerve power, lost temperature, lost secretion, and lost function of every kind. To accomplish all this, Hamilton says we must *bleed.* For to suppose that the abstraction of a few ounces of blood, so carbonized as to be almost unfitted for the purposes of life, if not positively deleterious, would depress the strength of the patient, is both illogical and contrary to experience. Before or after venesection, he gives an emetic of ground mustard, to stimulate the arterial circulation and restore animal heat; then relies on carb. ammonia and alcoholic stimulants; and keeps the feet and skin warm. There is generally an excessive cold perspiration, which further depresses the already wasted vital power; it should be wiped constantly away with heated flannels, and the limbs rubbed incessantly by strong hands and willing hearts. To arrest the exhausting discharges and alleviate the cramps, Hamilton thinks, is no easy task while a profound congestion exists; but he uses morphia in camphor-water liberally, or pills of opium and camphor, or aromatic tinctures, or creosote. A large dose of calomel, fifteen to twenty grains, he says, is often necessary, and will promptly arrest both vomiting and purging.

PREVENTION.

The three great means of prevention against a general epidemic are, Quarantine, Cleanliness, and Disinfection.

1. QUARANTINE.

As cholera is always brought to this country and city in ships, a long-continued and most rigid quarantine should be maintained. There is every reason to suppose that that of 1866, severe as it has been, was not sufficiently so. Three weeks' detention in quarantine after the last case is none too long, even when coupled with the most perfect disinfection of clothing and baggage. In Europe, the general impression is that cholera cannot be excluded by quarantine; still, there are not a few instances which prove that it may. At Sarepta, on the Volga, there is a settlement of Moravians, which, during three several epidemics, of the whole surrounding country, remained untouched. In addition to their proverbially good and cleanly habits, these thoughtful people maintained a perfect system of quarantine. Again, there have been fourteen epidemics of cholera at Staten Island, and only four have reached New York. It cannot then be said that quarantine, even in the careless and inefficient manner in which it has, for the most part, been heretofore enforced, has been altogether a failure here. But recent occurrences prove that it must be very rigid to be successful. On the 14th of July, 1866, Mrs. McCoy, a hospital nurse from the quarantine ship Falcon, visited Ward's Island, and was attacked with cholera; her two children, who had spent the greater part of the previous day with her, were next attacked. On the 16th, Mrs. Burns, a very healthy woman, and companion of Mrs. McCoy, sickened and

died in twelve hours. The woman who washed the clothing of Mrs. Burns was the next victim, being attacked on the 18th, and dying after an illness of less than twenty-four hours. The outbreak then became general in the wash-house building, and has since spread to other wards and the lunatic asylum. In the course of nine days, thirty-one cases and seven deaths occurred, and in two days after eleven more were reported in a dying condition.

Recruits newly enlisted from among emigrants who arrived in cholera ships, brought the disease to Hart's and Governor's Islands, among the United States troops assembled there, and thence it was carried by them, per the San Salvador, to Tybee Island. In less than a month, of four hundred and seventy soldiers, only eighty answered at roll-call; ninety-five have died, over one hundred have deserted, eighty-seven are in hospital, and the rest were more or less sick. It was common to see ten buried before breakfast, and the same number before supper. The statistical reports of the United States army from 1839 to '59, contain many similar instances. Thus, in 1848, it was carried by United States troops from New Orleans to Texas, and thence spread far up into the Indian country and to Mexico. From 1848 to 1854, the effects of the Swanton epidemic were regularly carried to Forts Laramie and Leavenworth. Fort Laramie is on the route to California and Oregon, and often overrun by emigrants. The cholera was confined to the road, and carried along by the emigrants; many Indians lingered along the line of march, from curiosity and for the purpose of begging, but they paid a terrible penalty. Fort Leavenworth is a general depot of supplies, and a starting point or rendezvous for troops on the march to New Mexico, and to the stations on the Great Plains. The disease was brought to it by troops from St. Louis,

and most of the commands also suffered in ascending the Mississippi and Missouri rivers.

For a week or two, emigrants with supposed cholera morbus were admitted into the Bellevue Hospital, in July, 1866; but soon the disease took the shape of genuine Asiatic cholera, and by the 25th, nineteen cases had occurred. It has lately been ascertained that the first outbreak this season on Ward's Island originated among passengers from the Atalanta.

2. CLEANLINESS.

Watson says some of the causes of cholera are beyond human control. We cannot regulate the temperature of the air, nor determine its barometrical pressure, nor influence, on any large scale, its movements. But we can remove decomposing filth. We can have the streets cleaned, not merely swept carelessly; even if the contractors, like those of New York, claim that their agreement is to sweep the streets, not to clean them. We can open up close and crowded neighborhoods, and exert a rigid guardianship over the condition of tenement houses; we can clean the sewers and docks, and remove all nuisances. Most of these essential points have been attended to in New York, but the sewers and docks have not been reached. From the reports of the surgeons of the Board of Health we learn that some of the sewers in the best portions of the city are in a deplorable condition; many were built by contractors ignorant, or indifferent to the simplest principles of sewerage, so that not a few of them run up hill. Thus, the sewer in Twenty-sixth street, between Second and Third avenues, has an ascending grade of three feet two inches to be overcome by deposits accumulated from behind, before any flow can occur; in Thirty-fourth street, between Fifth and Madison avenues, the

sewer ascends two feet, in two hundred and fifty; in Madison avenue, between Thirty-second and Thirty-third streets, it rises eleven inches in two hundred feet; the sewer in Thirteenth street, between Sixth and Seventh avenues, also runs up-hill, and is always nearly seven eighths full of drain-muck, which is forced back to, and up and down, the Sixth avenue, thence into Fourteenth street, along and past Union square. Nineteenth street, between Sixth and Seventh avenues, is in the same condition. The numerous connections between these overcrowded and noisome sewers and the houses, by means of water-closets, bath-rooms, and wash-stand waste pipes, become so many channels to conduct foul air into the very centres of our dwellings. In most of the lateral rains, except during the progress of a heavy rain storm, the actual flow in the pipes is reduced to a mere driblet, and these appalling masses of filth underlying our city, exhale their mephitic vapors into our very sleeping chambers; in fact, our water-closets, bath-tubs, and stationary wash-stands, act as ventilators to the sewers; and the more completely a house is provided with the modern conveniences, the more deadly a habitation it may become. Persons living in the immediate vicinity of the obstructed sewers are not the only ones to suffer; for, if once a sewer becomes wholly or nearly closed, the poisonous gases which are often rapidly and continuously disengaged, are forced back through the connecting pipes into far distant houses. No plumber's trap yet invented can prevent the passage of the foul air, the effect of which is so decided that butchers in London are obliged to avoid the vicinity of ventilating holes and culverts, because their meats soon become tainted. Fortunately the remedy is comparatively easy; it is only necessary to connect with the waste or soil pipe, just below the lowermost trap, a

small tube which must be led up through the roof and out into the upper air. In London, connections have been made with the flues of manufacturing establishments, and it is proposed to erect immense chimney stacks for this sole purpose. In addition, in London, in 1859, £20,000 were expended in flushing the sewers with fresh water; and one hundred and ten tons of lime, and twelve tons of the chloride, were thrown in every day, at a weekly cost of £1,500. It is to be hoped that during the next winter the grade of our most faulty sewers will be changed; but in the meantime, solutions of copperas, or chloride of lime, or carbolic acid, should be poured into the pipes of wash-stands and bath-tubs, as well as those of water-closets. As a further precaution, a piece of cotton may be placed over each outlet at night, for it has been observed that when meat is exposed to air which has been passed through cotton, it will not putrefy for months; it is clear that cotton takes up something injurious from the air.

DOCKS.

Many of our sewers open into bulkheads instead of the tideways, and others even into vacant lots. Our docks, like the Thames, are converted into common sewage receptacles. Foul with the daily and hourly influx of abominable filth, they are offensive to the senses, and a cause of added foulness to the incumbent atmosphere. Glaisher says that, during the summer months, the night temperature of the Thames is considerably above the minimum temperature of the air, and that its vast area is simmering all night long, and throwing off clouds of noisome and noxious vapor, causing the special unhealthiness of those quarters of the town which lie nearest its banks. The same is the case with our North and East Rivers.

PERSONS.

Personal cleanliness is very important, for there is every reason to believe that foul skins and clothing, reeking with unremoved and decomposing filth, create an atmosphere about each of the "great unwashed," that may be quickly converted into a nucleus of cholera poison, if the least contact with the disease takes place.

If the owners of emigrant ships would rigidly enforce the cleansing and disinfection of the persons and baggage of their passengers before they are allowed to proceed on board, there is every reason to suppose that not only cholera, but ship-fever and other analogous disorders, would be imported into this country far less frequently than they now are.

3. DISINFECTION.

In Europe the general impression is that cholera cannot be excluded by quarantine, but that it may be "stamped out" by disinfection. The Board of Health of Hull, a city that is daily exposed to imported infection, enforce no external regulations against cholera; but the city and railway authorities take good care to send all German emigrants forward to Liverpool and elsewhere by special trains, and thus avoid any intercourse with them. But cholera has now not only broken out in Hull, Liverpool, Bristol, and London, but in many towns in Lancashire and Wales. Southampton is again suffering severely, although the sanitary authorities treat every case and locality of cholera by prompt medical treatment and instant disinfection. Pettenkofer, the chief apothecary to the king of Bavaria, thinks that the facility of transmission of the disease is so great, and such the uncertainty and inconvenience of any

universal prohibitory restraint upon commercial intercourse, that it is futile to depend upon the isolation and quarantine of entire towns and districts; but that it is far better to rely upon disinfection of houses, grounds, and the evacuated fluids of the sick. Thorough disinfection and cleansing are declared to be the best means of protection against cholera. All putrescent and decaying matter, and very particularly all excrement and whatever has received the choleraic discharges, must be disinfected by powerful antiseptics. Sulphate of iron or copperas, in strong solution, is thought to be the most efficient and potent. Carbolic acid, and other coal tar preparations, are next, and nearly equal in power. Wunderlich insists upon the vital importance of complete and frequent disinfection of every privy and filthy place in every diarrhœal district, both before and during cholera epidemics; for if cholera discharges get into them, the whole accumulation may be changed into a mass of cholera poison.

As early as 1854, Dr. Wm. Budd, of Bristol, proved the efficacy of immediate disinfection of the cholera discharges. In 1849, cholera was brought into the Bristol workhouse by a woman coming from an infected quarter, and not less than one hundred and thirty died out of not quite six hundred inmates. In 1854, immediate disinfection was tried, at the suggestion of Dr. Budd, and although the pestilence was introduced three separate times, the total number of attacks was under thirty, with only eight deaths. We have already stated that the mortality at Ebrach was fifteen per cent. of three hundred and fifty prisoners, where no disinfectants were used; while at Kaishaim only one case died out of a thousand men, where these were relied upon. At Traustein, in Bavaria, in every case in which the rice-water discharges were disinfected with

sulphate of iron, the disease was confined to the first person seized. The New York Health Board have adopted the disinfecting plan wisely and efficiently, and would have quickly checked the numerous outbreaks of the distemper if they had been properly seconded by officials and individuals; although places like the Brooklyn plague district must always be difficult to manage. Thus, in the neighborhood of Van Brunt and Wallace streets, where the deaths have been most numerous, the ground is low and marshy; the houses are small and dirty tenements, in which many families swarm. Waste pipes have not been laid through the streets, and more than three hundred families, and over fifteen hundred people, are dependent for washing, drinking, and cooking water upon the scanty supply from one dilapidated soil pump. The low, nasty surface of every back-yard, is still further befouled by numerous surface privies, and by drainage from many shanty stables, in which horses and hogs are crowded. It is no wonder that the disease has become fatal and concentrated, for the air is freighted with contagion, and the ground from which the inhabitants draw and drink their water is impregnated with the quintessence of the disease.

It is well to be acquainted with the proceedings and recommendations of the New York Health Board: Freshly-prepared lime and charcoal, in the proportion of two parts of the former to one of the latter, ground together in a coarse powder, have been used in vast quantities to disinfect out-door privies, the contents of which could not be safely removed until winter. It is supposed that an ordinary house-pailful of this mixture, thrown over the surface of the contents of a sink or cesspool once a week, or even once in two weeks, will render them quite innocuous. This so-called *carbo-calx* mixture has

been thickly sprinkled over defiled surfaces and places, such as cellars and yards.

Chloride of lime, saturated solutions of sulphate of iron, (copperas), carbolic acid, coal tar, and other acids, have been lavishly applied to disinfect waste pipes and house drains. Ten pounds of strong chloride of lime are directed to be thoroughly mixed in half a barrel of water, and a small portion of it poured daily down kitchen sinks, soil pipes, and all others from which offensive gases arise. But Carbolic acid is the most powerful of deodorizers, preservatives, and disinfectants. Chloride of lime merely removes the smell of decomposing matter, while carbolic acid actually prevents decomposition. A piece of putrefying meat, soaked in a solution of carbolic acid containing one per cent. of the acid, does not lose its offensive smell for two days, when it will be replaced by a faint odor of carbolic acid, and no further decomposition will take place for a month or more. Chloride of lime removes the bad smell immediately, but decomposition goes on quite rapidly. House drains and cesspools, soil pipes of water-closets and privies, and all foul drains, according to Dr. Harris, should receive a dose of carbolic acid or coal tar, every day or two. After these places have been flushed with a large quantity of water, and a few pints of coal tar have been poured down them, then a teacupful every two or three nights will be sufficient, not only to keep down all putrefaction and sink smells, but will maintain constant disinfection. If carbolic acid or coal tar cannot be procured, the same quantities of a thick, creamy solution of chloride of lime, and a pint or two of a solution of copperas, in the proportion of ten pounds to a pail of water, may be relied upon. To render the disinfection as complete as possible, a pint of this solution of copperas should be

poured into each water-closet and privy-seat every night, and a small quantity down each bath-tub and wash-stand drain. It is highly probable that strong solutions of coarse salt and saltpetre will be found to be almost equally efficacious.

In private houses, in addition to the free use of lime, chloride of lime, or lime and charcoal, in cellars, the use of coke as fuel, and the presence of a chaldron or more on the premises, will be of great service as a preventive of the disease.

As *ozone* is deficient in the air in cholera times, steps should have been taken to supply it; for ozone is a vital element of the air, and oxygen cannot be assimilated by the system without its presence. It gives to oxygen its life-supporting properties, but is rapidly destroyed in large towns and in crowded and filthy localities. During periods of great heat of weather, it also loses its active powers. In the absence of ozone, offensive products are increased; wounds become unhealthy and heal slowly; and diseases which show a putrefactive tendency are influenced injuriously. Fortunately, it can be readily supplied to houses and hospitals. Moffatt has used phosphorus for the production of ozone as a purifier and disinfectant, thus: Take a quart bottle with a wide mouth, into which put rather more than half a pint of water; on a piece of cork floating on this fluid, place a flat piece of phosphorus with a clean-cut surface; close the mouth of the bottle either loosely with a cork, or tightly with a perforated cover. This should be done night and morning, or several times a day. Squibb directs half a stick of phosphorus to be laid upon the flat surface of an ordinary breakfast plate, and water poured upon it sufficient to immerse two thirds of the stick, leaving the remainder exposed to the air; the plate is then to be placed upon the mantel-

piece, out of the reach of accident or disturbance. At night, more water is to be poured upon the plate, till but a narrow line of the stick is exposed above the surface; for great evaporation will take place before morning. When the desired disinfection has been accomplished, the plate should be filled with water until the phosphorus is entirely covered. There are several objections to the use of phosphorus: first, from its easy inflammability, it is a dangerous substance at best; second, the vapors from it at night are lurid and disagreeable to the sight of nervous persons; and third, if too much is allowed to burn, the phosphorous acid irritates the air-tubes. But, in careful and intelligent hands, it is exceedingly useful, and, to cholera patients, somewhat curative.

Bromine is an excellent disinfectant, and evaporates spontaneously and so rapidly, that the simple removing the stopper from a narrow-necked bottle will soon deodorize the atmosphere of a room. The bottle should not be left open too long, but be closed from time to time.

DISINFECTION OF WATER.

In all places where water from springs, wells, or pumps, is used, if there is the slightest danger of impurity, means of purification should be used. It has been fairly proved that even water, contaminated with choleraic matters, loses its infectious properties by being boiled and filtered. But boiled water should be allowed to become thoroughly cold, and allowed to absorb air in place of that which has been expelled by heat, before it is drank. An excellent filter for the poor is one of the largest-sized common red flower pots, suspended at a convenient height of a few feet, in a shady place, and having the hole in its base plugged with a sponge, so as to permit only an

exceedingly fine stream of water to pass through; the sponge must, of course, be washed frequently. A good filter should be attached to every faucet from which drinking water is drawn, and a thick flannel bag makes a good substitute until a better can be procured. Every traveller should supply himself with a small bottle of the saturated solution of *permanganate of potash*, for it has been found, in India, that at stations where the water was turbid, and tasted and smelled of decaying organic matter, the addition of a few drops of this solution rendered the water as clear and sweet as spring water in a few minutes. The permanganate is innocent in character, and removes the most putrid odors as if by magic. It is an excellent disinfectant, and may be put in the foulest water, or the most repellant mixtures, and the sense of smell will cease to be offended; while we may be sure, also, that all injurious substances will be destroyed.

The *Peroxide of Hydrogen* is still more efficient. It looks like water; but if we pour it on the filthiest substance, the smell of putrefaction ceases, and in many cases a sweet odor or fragrant perfume, created in an instant, arises in its place. It was formerly dear, and there were but few places where it could be had cheaply, and then only in small quantities; but Professor Schoenbein has discovered that it may easily be prepared, by shaking violently, for a few seconds, amalgamated granulated zinc with a little distilled water contained in a large bottle.

Finally, Dr. Thomas Spencer has discovered that the black oxide, or so-called magnetic carbide of iron (prepared by heating together hæmatite, or red oxide of iron ore, with sawdust), frees water from nearly all its organic impurities. If ordinary river water, even the more impure kinds of it, is made to per-

colate a layer of magnetic carbide some inches thick, it is not only filtered, but deprived of much of its *soluble* organic impurities. The water becomes bright, loses its yellow color, and is free from smell or taste of any kind. If a few drops of a solution of permanganate of potash be well mixed in this filtered water, its pink color will remain, while impure water will destroy the beautiful tint of the permanganate. Filters, prepared with the magnetic carbide, will last for seven or ten years, without requiring cleansing, or refitting.

Since writing the above, the principal causes of the malignancy of the epidemic at Hart's Island, among the United States soldiers have been ascertained. The place had been previously defiled by thousands of Southern prisoners; emigrant recruits brought the disease, and the special poison of cholera was multiplied suddenly and extensively. The soil was so saturated with old filth that *the drinking water* also became contaminated. The island has wisely been abandoned, as it was impossible to disinfect the ground and water.

Cholera has broken out suddenly in the Kings county jail, which is a model of cleanliness; thirty-eight inmates were attacked in one night. About one mile off are extensive piggeries, offal fields, and swill establishments, of the most offensive character, which poison the air for acres around; still none of the pig, swill, or offal men have as yet been affected with cholera. It will soon be found that one or more cholera subjects have been introduced into the jail, but that none have gone to the piggeries.

TREATMENT.

MANAGEMENT OF PATIENTS AND NURSES.

In a case of cholera of any severity, the carpets should be taken up ; the room stripped of all unnecessary furniture and ornaments ; the bed—which had better be a single one—should be placed in the middle of the room, for free ventilation and ready access on all sides, and should also be guarded with an India-rubber sheet. All discharges must be received in basins, chamber-vessels, or bed-pans, in which a tablespoonful of the solution of copperas and a tablespoonful of chloride of lime, or a mixture of salt, magnesia, and dilute sulphuric acid, have been put. The air of the apartment, the neighborhood of the bed, the vessels themselves, and the dejections, will thus be thoroughly deodorized, disinfected, and rendered harmless. At the same time, the waste and soil pipes will be put in an improved condition, for the greater the number of the discharges, the more frequently will the drains and sewers be supplied with disinfectants. Very careful persons may, in addition, pour a pint or two of the solution of copperas in the water standing in the privy-seat, and sprinkle a teacupful of the carbolate of lime, or chloride of lime, or of the carbo-calx powder, over its sides, whenever cholera discharges have been passed through them.

Bed and body linen, and toweling used by cholera patients and their nurses, should be immediately put into a tub, in which one ounce of permanganate of potash has been dissolved in every six or eight gallons of water. Or a pint of Labarraque's solution of chlorinated soda may be used for the same purpose, in a tub of water. Either of these solutions may be

used in cleansing the soiled parts of the bodies of sick or dead persons.

Nurses should cleanse their hands, and those of cholera patients, frequently, in water in which a few drops of the saturated solution of permanganate of potash has been mixed; and should never partake of food without first carefully washing their hands.

With these precautions, there is not the slightest danger to those who attend cholera cases. If sickness should occur among them, it may be safely assumed that they had contracted it previously, and that the germs were lying dormant in their systems. There should be a sufficiency of nurses, so that none of them may become greatly fatigued or distressed, and that each shall have an abundance of sleep and rest, with time for leisurely and regular attendance at meals. Attendants must, of course, be very careful about their food, but should eat sufficiently of plain beef, mutton, or poultry, rice, farina, hominy, bread, toast, and similar staple articles. Green tea is the best beverage when there is a tendency to looseness; coffee, chocolate, or black tea, may be used when costiveness is present. Salt should be eaten freely, as it is one of the best of tonics and disinfectants. Beaman thinks that a somewhat weakened state of the stomach and bowels predisposes to cholera, and that this is removed by eating freely of salt at meals; he believes that at least three fourths of all cases of cholera could be prevented by this simple means. Adults may consume from one half to a whole teaspoonful at each meal, and in two days it is supposed that the majority of persons will be no longer susceptible to the disease. Its daily use in smaller quantities should, however, be persisted in as long as the epidemic prevails. The moderate

use of condiments, such as black and red pepper, French or English mustard, or Worcestershire sauce, or of cinnamon, nutmeg, allspice, &c., is often useful, for all these articles are antiseptic as well as stimulant. Ginger syrup, with plain or soda water, is a good beverage. Isinglass, one-quarter ounce, sugar, two lumps, in a small tumbler of boiling water, with half a wine-glass of brandy, or a wine-glass of sherry, or two wine-glasses of claret, and a little nutmeg or cinnamon, is a capital nightcap for one who is very much fatigued and afraid of cholera.

Or a wineglass of the following mixture may be taken occasionally: spirit. vini gallici, ℥iv.; aquæ cinnamoni, ℥iv.; vitel. ovorum, No. 2; olei cinnamoni, m. v.—BRANDE.

If there is any fear from inhaling the breath of a cholera patient, twenty-four grains each of hypermanganate of potassa and hyperoxydate of barium, should be rubbed up with sugar and glycerine, and divided into one hundred and forty-four lozenges; the patient should use them frequently, and the attendants may also. Every ill-smelling mouth will become entirely odorless by their use.

Nurses should wear a broad band of flannel around their persons, and should dress and sleep rather warmly. A check of perspiration, or a chill at night, is especially dangerous. They should not allow themselves to remain costive, but may occasionally take one or two simple non-drastic pills at night.

Aloes socrotine, two grains; soap, in fine powder, 2 grains; ext. nux vom., one quarter grain.

Or, rhubarb, three grains; soap, one grain; ext. nux vom., one quarter grain. Or sulphate of iron may be substituted for the soap.

If fatigue and distress cause loss of appetite and indigestion,

one half or a whole teaspoonful of the compound tincture of gentian, or simple Stoughton's bitters, may be taken in a little sweetened water before each meal; and one or two teaspoonfuls of pepsine wine after each repast. Fatigue and debility may be removed by wine of iron or bark, or sherry and water, or spirits and gum-arabic water, or claret and water. If debility and diarrhœa commence, a small teaspoonful of the following powder may be taken at each meal time: ferri lactici, ʒss.–ʒj.; calc. phosphatis, ʒj.; calc. carbon, ʒij.; sacch. lact., ʒss.–ʒj.; pulv. cinnam., ʒj; mix and make a powder.

Or a pill consisting of one or two grains each of sulphate of iron and extract of gentian, and one quarter grain of extract of nux vomica, may be taken two or three times a day.

Or a tablespoonful of a solution consisting of: quinine, sixteen grains; sulphate of iron, twelve grains; aromatic sulphuric acid, one drachm, in six ounces of water, may be taken several times a day.

The *sulphate of iron* is an astringent, tonic and disinfectant, and will not only brace up the system, but destroy any germs of cholera which may have obtained access to the system. It will probably prove the best preventive and curative remedy against Asiatic cholera.

PRODROMIC DIARRHŒA.

Gull says that the diarrhœa premonitory of the severer symptoms of cholera is often feculent and bilious, and presents no characteristics whereby it can be certainly distinguished from other forms. The number of discharges that precede an explosion of cholera varies considerably. Frequently there are not more than two or three in twenty-four hours; at other times as many as twenty, continuing for days, and even weeks.

As cholera prevails in the months and seasons in which attacks of diarrhœa, cholera morbus, and other bowel complaints, are most frequent, it is not only extremely probable, but absolutely certain, that the majority of those cases have no relation whatever to true cholera. They may and should be regarded with the same equanimity as in more healthy seasons, and only require the treatment which has been found efficacious in ordinary times. In fact, the greater number would recover without any medicine, if rest in bed and care in diet were maintained. For the remainder, very simple treatment is often sufficient.

We append a number of simple but reliable prescriptions, from which any intelligent physician can easily make a choice :

1. Dr. Bowerbank generally found a little ginger-tea, with a few grains of carbonate of soda, and an equal quantity of common sense about diet and absolute rest, quite sufficient.

2. Other physicians recommend the patient to go to bed, keep warm, and drink several cups of hot green tea, or of herb or mint tea—the object being to produce perspiration.

3. Peppermint-tea is recommended by Parisian physicians, in quantities of a cupful every quarter or half hour, quite hot and sweetened ; with or without the addition of a tea or tablespoonful of old rum or brandy, and twenty drops of tincture of cinnamon, till perspiration is caused and diarrhœa checked ; which generally happens in three hours. If it causes vomiting, it should be discontinued.

4. Physicians of all schools rely much upon *camphor* in the treatment of cholera. In 1832, the Edinburgh homœopathists used over five gallons of the tincture. It is said to have saved fifty-four persons out of sixty-five, and is also supposed

to destroy the contagion of the disease, so that the sick person is no longer dangerous to his attendants after he has taken a few doses. Dr. Rubini, of Naples, claims to have treated five hundred and ninety-two cases without a single death, with the saturated spirits of camphor. We presume that he did not make it six hundred, on the same principle as the boy's father, who killed ninety-nine ducks at one shot, refused to make it one hundred from fear of telling an untruth. Rubini uses alcohol, sixty degrees above proof, and says he is able with it to dissolve its own weight of camphor. This preparation is nine times as strong as the one in ordinary use, and twice as potent as that used by the homœopathists. He gives four drops every five minutes; but in severe cases increases the dose to five or twenty drops, or even a small teaspoonful. Ordinarily, in from two to four hours, an abundant perspiration will break out, and a cure soon follows. As a preventive, he recommends five drops three or four times a day. These doses should always be taken on lumps of sugar, and not in water. In the United States army, from two to four, or even seven and eight grains are often given in a teaspoonful of Hoffman's anodyne.

5. From a tea to a tablespoonful of paregoric has often proved sufficient. Equal parts of compound spirits of lavender and paregoric are often relied upon with confidence.

6. One or two drachms of alum dissolved in five ounces of water, with the addition of one ounce of syrup of ginger, makes a palatable and useful medicine, in doses of one or several teaspoonfuls, frequently repeated. Iron-alum may be prepared and used in the same way.

7. Syrup rhei. aromat., ℥j.; aquæ menth. pip., ℥iv. Dose, one or two teaspoonfuls in diarrhœa, vomiting, cholera morbus, and cholera infantum.

8. Carbonis ligni, ʒj.; theraicæ, ʒj. Dose, one teaspoonful from two to four times a day, in diarrhœa from fæcal fermentation.

9. Tinct. cinnamomi, ʒss.; spir. ammon. aromat., ʒss.; decocti hæmatoxyli, ʒv. Dose, one quarter part, after every loose motion.

10. Pulv. carb. ammon., ℥ij.; aq. menth. pip., ʒiv. Dose, one to three teaspoonfuls every half, one, or more hours.

11. Velpeau recommends absolute rest in bed, and three or four drops of laudanum every one or two hours, until vomiting and diarrhœa pass away. He also advises very small injections of starch, with seven or eight drops of laudanum in each.

12. Ammon recommends potass bicarb., ℥j.; aq. menth. pip., ʒvj. Dose, a spoonful every hour.

13. Bismuthi nitratis, ℥ij.; pulv. opii, gr. i.–ij.; pulv. cinnam., ℥ij. Make eight powders, and give one every two or four hours in incipient cholera.—Ammon.

14. Bismuth mixture, prepared exactly like the officinal chalk mixture, is an excellent preparation, and most efficient when there is much distress in the stomach.

15. Simple *chalk* mixture, prepared with half an ounce of prepared chalk, a quarter of an ounce of loaf sugar and gum-arabic powder, and eight ounces of cinnamon or other aromatic water, is very useful in diarrhœa. To render it more astringent, one ounce of tincture of catechu, or kino, is often added. The dose is one or two teaspoonfuls, to as many tablespoonfuls for adults. It is supposed that the chalk is not only an astringent but a disinfectant. If there is much distension of the bowels, one ounce of aromatic powder may be added to the mixture.

16. Others rely on the *aromatic powder*, composed of cinnamon and ginger, each two parts; cardamom seeds and nutmeg, of each one part. Dose: ten to twenty grains, in water. The addition of twenty grains of prepared chalk makes it a very efficient medicine in diarrhœa.

17. Sodæ bicarbonatis, ℈j.; sulphuris præcipitati, ℈j.; tinct. lavand. comp., ʒss.; aquæ, ʒiij.–v. Dose: one or two tablespoonfuls every two or three hours in ordinary diarrhœa preceding cholera.—Grove.

18. Infus. acori calami, ʒiij.; gum acaciæ pulv. ʒj.; sacchari albi, 3ij. Dose: a tea to a tablespoonful every one or more hours.

19. Tinct. rhatany, ʒj.; aquæ calcis ʒv. One to three spoonfuls after every passage.

20. Bismuthi nitratis, 3j.–3ij.; elect. catechu, 3ij. Make four-grain pills, and take from one to three every hour in choleriform diarrhœa.

21. Monesiæ, 3j.; aluminis, gr. xxiv.; confect. aromaticæ, 3ss.; syrupi, q. s. Make twenty-four pills, and take two after every passage.

22. Acidi sulphurici diluti, 3ij.; tinct. cardamomi co., ʒss.; aquæ menth. pip. ad, ʒvj.; sacchari albi, ʒss. Dose: one-fourth part every two or four hours.

23. Tinct. gallæ, ʒss.; mist. amygdalæ, ʒiss; mist. acaciæ, ʒss.; aquæfontis, ʒv. Dose: one tablespoonful after every liquid passage in colliquative diarrhœa.—Neligan.

24. Ext. hæmatoxyli, 3j.; decocti cinchonæ, ʒiij.; aquæ cinnamomi, ʒss.; syrupi aurantii, ʒss. Dose: one or two teaspoonfuls every hour in cholera infantum.—Ure.

25. Decocti hæmatoxyli, ʒviij.; aluminis pulv., 3ss. Solve for an astringent enema.—Reece.

26. Ext. nuc vomicæ, gr. ij.–vj.; Aquæ mellissæ, ʒvj.; mucilag. acaciæ, ʒss. Dose: two spoonfuls every two hours.

27. Creasoti, ʒj; ext. glycyrrhizæ, ʒss.; galbani colati, ʒss.; althaeæ rad. pulv., ʒij. Make sixty pills, and take two or three from three to six times a day.—Riecke.

28. Ferri carbon. saccharati, ʒss.; pulv. myrrhæ, gr. xxiv.; pulv. aromatici, ʒss. Make twelve powders, and give one every two or four hours in protracted and obstinate diarrhœas of children.—Neligan.

29. Ferri sesquioxidi, ʒj.; pulv. cinnam. co., ʒj.; syrupi Aurantii ʒj. Make an electuary, and give a spoonful from three to six times a day.—Joy.

30. Ferri sesquioxidi, gr. x.–xx.; pulv. aromatici, gr. v.; syrupi zinziberis, q. s. Make a bolus, to be taken from two to four times a day.—Copland.

31. Misturæ ferri compos. ʒiss.; aquæ cinnam., ʒss. The whole to be taken from two to six times a day in the diarrhœas of feeble and exsanguine persons.

32. Ferri et aluminæ bisulphat. (*iron-alum*), gr. v.–x.; aquæ cinnam., ʒiss. To be taken every two or three hours.—Murray.

33. Pulv. kino, ʒv.; pulv. aluminis, ʒij.; pulv. cinnam., ʒij.; syrupi, q. s. Make an electuary, and take one or two teaspoonfuls occasionally.—Savory.

34. Bismuthi, ʒij.; cretæ prep., ʒij.; pulv. cinnam., ʒij.; sacch. alb. ʒiss. Make a powder, and take from one quarter to a whole teaspoonful every two, four, or six hours.

CHOLERAIC DIARRHŒA.

Le Segue says this is liquid, serous, watery, abundant, and more or less colored. The stools succeed each other every

hour or two, or sometimes oftener. After the second or third they become whitish, like very thin paste, are voided without pain, and cause no sensations of burning or tenesmus. In the interval there is an occasional rumbling. When, after five or six stools, the appearance of the matters passed is unchanged, and the dejections are no more watery nor paler, it is a favorable symptom. The evacuations are not followed by that sensation of sinking so frequently associated with smaller discharges. The vomitings are sometimes green long after the discharges have become exclusively serous. It is generally supposed that this form of diarrhœa is not more difficult to treat than the ordinary form. But this is not quite true; it does not yield very readily, and soon becomes a source of great danger. Burrows says the facility with which the serous diarrhœa may be checked, depends mainly upon the period of the epidemic when the treatment is adopted. Those remedies which are powerless at the height of the epidemic, will prove efficacious towards the decline. Cases of serous diarrhœa, with symptoms of exhaustion, short of collapse, appeared to him, in spite of unremitting attention, to be quite uncontrollable in the month of July; while cases of equal urgency, in September, were controlled with a facility which often astonished him.

In the treatment of this disorder it is best to commence at once with the most efficient and specific remedies. These I believe to be sulphate of iron (or copperas); iron-alum; nux vomica; kreosote, which is a pure carbolic acid; the preparations of lime and bismuth; chloroform, &c. I append a number of prescriptions:

1. Sulph. ferri, gr. ij.–iij.; ext. nuc vomicæ, gr. $\frac{1}{6}$–$\frac{1}{4}$; ext. gentian, gr. j., make a pill, to be given every one, two, or four hours.

2. Ferri. sulph., ʒj.; acid sulph. dilut., ʒj.; aq. pur. ☉iss. Dose: half or whole wineglass full every quarter, half, or one hour.—Bell.

3. Ferri. sulphatis, ʒj.–ij.; sacchari, ℥j.; aquæ cinnamomi, ℥vij. Dose: a tablespoonful every one, two, or three hours.

4. Ferri. sulphatis, ℈j.–℈ij.; acidi sulphurici, ʒss.–ʒj.; sacchari, ʒij.; aquæ, ℥iv. Dose: one or more teaspoonfuls every quarter, half, one, or more hours.

5. Ferri sulphatis, gr. v—x.; acid. sulph. aromat., ʒss–ʒj; aquæ, ℥j. Dose: one or two teaspoonfuls in water.

6. Acidi sulphurici diluti., ʒiv.; syrupi aurantii corticis, ℥iss.; aquæ cinnamomi, ℥j. Dose: one or more teaspoonfuls every half, one, or more hours.

7. Acidi gallici, ℈iss.; ext. gentian., gr. x.; ext. nuc vomicæ, gr. v.; make ten pills. Dose: one pill every one, two, or more hours.

8. Acidi gallici, gr. v.—xx. To be taken in a wineglassful of brandy and water every half, one, or more hours.

9. Extracti geranii mac. fluidi, ʒvi.; tinct. cinnam., ℥ss.; syrupi rosæ gallicæ, ℥ij. Dose: a dessertspoonful every half, one, or two hours.

10. Olei. terebinth, ʒj.; ætheris sulphurici, ʒiij. Dose: ʒss.–ʒj. in barley-water every one, two, or more hours.

11. Olei. terebinth, ℥ss.; mucilag. acaciæ, ℥ss.; tinct. lavand. co., ℥ss.; aquæ cinnam., ℥iiss. Dose: one to three teaspoonfuls in water every two or more hours.

12. Olei. terebinth, m. xv.–xxx.; aq. menth. pip., ℥j. To be taken every one, two, or four hours.

13. Olei terebinth, m. xv.–xl.; mucilag. acaciæ, ʒvj.; spir. lavand. co., ʒij. To be taken every two, four, or six hours.

14. Quinæ disulph., gr. x–xx.; ferri. sulph, ℈j–℈ij.; aq. pur.

☉iss.; tinct. nuc vomicæ, ʒss. Dose: one to three tablespoonfuls every half, one, or two hours.

15. Creasotii, m. xx.; tinct. cardam. co., ʒss.; mucilag. acaciæ, ʒss. Dose: ten to thirty drops in a wineglass half or quite full of water, every quarter, half, one, or two hours.

16. Creasoti gutt. x.–xx.; syrupi tolutani, ʒss.; tinct. cardam. co., ʒss.; aquæ anethi. vel, cinnamomi, ʒiij. Dose: a tea to a tablespoonful every one, two, or three hours, in choleraic diarrhœa.—Richardson.

17. Chloroformi, ℥ij.; tinct. camphoræ fort., ℥iss.; tinct. opii, ℥iss.; olei cinnamomi, m. viij.; alcohol, ℥iij. Dose: five to thirty drops.—Horner.

18. Chloroformi, x.–xx.; spts. vini. gallici, ℥iij.; syrup orgeat, ℥ij.; aquæ, ʒss.–ʒj. To be taken repeatedly.

19. Chloroformi, ʒss.; sol. magend., ʒss.; tinct. capsici, ʒss,; syrup zinziberi, ʒss. Dose: ten to sixty drops.

20. Squibb's mixture is much recommended. Tinct. opii, ʒj.; tinct. camphoræ fort., ʒj.; tinct. capsici, ʒj.; chloroformi, ℥iij.; alcohol, ad. ʒv. Dose: for infants, one to ten drops in a few teaspoonfuls of sweetened water, syrup of gum-arabic, or orgeat; for persons two to six years of age, ten to thirty drops; from six to ten years old, thirty drops; ten to fourteen years, half a teaspoonful; fourteen to eighteen, a small teaspoonful; all persons over eighteen years, one or two teaspoonfuls. The doses to be repeated after every movement.

21. Tinct. opii, ʒss.; spts. camphoræ fort., ʒss.; liq. ammoniæ, ʒss. Dose: ten to thirty drops.

22. Tinct. opii, ʒss.; tinct. camphoræ fort, ʒss.; tinct. catechu, ʒss.; cinnam., ʒss.; tinct. capsici, co., ʒss.; mucilag. acaciæ, ʒiss. Dose: one or two teaspoonfuls in water as often as necessary in the first stage of cholera.—Houston.

23. Acid. sulph, dilut., m. x.; aq. pur., vel cinnam., ℥ss. To be taken every one, two, or more hours.—Braithwaite.

24. Acid sulph. dilut., ℥ij.; tinct. cardam. co., ℥ij.; aq. destillat. ℥v., ss. Dose: one or two tablespoonfuls every four hours regularly, and after every liquid stool or vomit.—Miller.

25. The missionaries at Constantinople relied upon: tinct. opii, tinct. rhei., spir. camphoræ, equal parts; thirty to sixty drops per dose. They claim to have lost but thirty cases out of six hundred, and attributed their great success somewhat to their careful nursing and unremitting devotion, as they remained at the bedsides of the sick for hours, or until all danger had passed.

26. Quiniæ sulphatis, gr. xij.; ferri sulph. exssic., gr. xxiv.; pulv. opii, vel ext. nuc vom., gr. iij.; make 12 pills. Dose: one or two every two, four, or six hours.

27. Quiniæ sulph., ℈j.; ferri sulph. exssic, ℈ij.; pulv. capsici, ℈j.; make twenty pills. Dose: one or two every one, two, or more hours.

FULLY-DEVELOPED CHOLERA.

After a longer or shorter period of diarrhœa, the symptoms of the second stage are added. Suddenly, without much nausea, *vomiting* commences. At first, the ingesta are ejected; then follows, at diminishing intervals, a serous fluid similar to that discharged from the bowels, but without the admixture of chyle. The powers of life now rapidly fail; the skin becomes cool, the thirst intense, the pulse loses its force and increases in frequency, the whole surface of the body is bathed in a profuse perspiration, the features shrink rapidly, and the whole expression of countenance is changed; the voice sinks to an

almost inaudible husky whisper; cramps of the extremities set in, and finally extend to the trunk; the sensibility is rapidly impaired, being scarcely aroused by the most violent muscular spasms, and the patient evinces a remarkable indifference, as well to his present condition, as to his future fate. This is incipient collapse. During all this time, many patients suffer less pain than is generally supposed. The intense thirst, the frequent vomitings and calls to stool, are sources of much discomfort; but the only cause of actual pain is to be found in the cramps. Even the pain of these is often much less than in cases of ordinary cholera morbus and cramp colic.

In this stage the quantity of fluid pouring out from the mucous membrane of the stomach and bowels is so great, that all food and medicines, are swept along and away with it. Little or no absorption takes place, and the largest and smallest doses of the most active and the mildest medicines are alike powerless. Brandy and red pepper are as innocuous as water; half-ounce doses of calomel and laudanum are as innocent as the thirtieth dilution of chamomilla; five-drop doses of Croton oil are as harmless as so much oil of olives.

Macpherson's directions are: secure the best hygienic conditions possible for your patients; give them abundance of water to drink and ice to suck; correct cramps and inordinate vomiting by the internal and external use of chloroform. Apply external warmth and extra bedclothes, if these are grateful to the patient, but if they make him restless, do not press them, for it is unwise to submit him in any way to a disagreeable heat, which materially adds to his sufferings and danger. If the perspiration is excessive, wipe him dry from time to time, disturbing him as little as possible, for excessive rubbing is useless, and exhausting to patient and nurses. But

the abdomen and limbs, according to Magendie, may be rubbed occasionally with a mixture of tinct. nux vom., ʒij.; linimen. saponis, vel ammoniæ, vel chloroformi, ʒss. Still Macpherson asks whether it is a judicious measure to apply heat externally; to cover up the patients with blankets; to stimulate the surface with counter-irritants, such as mustard, turpentine, &c. He has done all these things, and questions whether much is gained by them; he is quite sure that they are very distasteful to nine patients out of ten, and their instinctive promptings is worth something; he knows that it is so in the matter of drink in cholera, and he *thinks* it is so in the question of food, clothing, and frictions; where they are grateful they may be used, but ought not to be insisted upon when the reverse is the case. There is a greater tolerance of blanketing in Europe than in India.

As soon as the rice-water evacuations commence, Dr. John Gason, of Ireland, places a towel, very tightly rolled up, so as to be nine or ten inches long and one and a half or two inches thick, directly between the buttocks, so that the orifice of the bowel comes directly on the middle of this roller, which should be sprinkled with a solution of chloride of lime, or some other disinfectant. If properly made and placed, it is said, no evacuation can possibly take place, not even as much as will stain it. Together with this, a broad flannel bandage should be tightly carried around the whole body, three or four times, and the part next the skin, especially that portion over the bowels, should be well sprinkled with chloroform. This flannel roller is as important to a cholera patient as a bandage is in uterine hæmorrhage after confinement, for the bowels are completely relaxed and paralyzed, and require support.

The regulation of the food and drink of the patient is of the

greatest importance. When Macpherson first went to India, it was a common practice to withhold water, especially cold water, from cholera patients; the objection was, that it increased vomiting and so exhausted the sufferer. Following the routine of the day, he acted in this way, but was taught the cruelty and folly of it by personal experience. When a person has been drained for an hour or two by rice-water purging, the desire for water is urgent and instinctive; the system craves and demands it. Do not then be guilty of the cruelty of withholding water, but give it often and give it *cold*, for hot drinks are not relished by cholera patients. There is no necessity to give large draughts; but let not the fact that a portion of almost every supply is vomited lead you to withhold it entirely. Let your patients have as much ice as they please. Macpherson never saw a cholera patient to whom ice was not grateful. In his own case, he took no drugs, but drank freely of iced soda-water, to his infinite comfort and refreshment. When he vomited, which he did often, he drank again; when too feeble to speak, at a look or a gesture, his faithful nurse replenished his glass again and again. He then formed the fixed resolution, never since departed from, never to withhold a cup of cold water from a cholera patient. Seltzer, Vichy, or carbonic acid water, with the addition of a little iron, or some iron-water, like Pyrmont, may be used with advantage. Champagne and water, or iced champagne, may be taken occasionally, or a wine or claret glass of green tea punch, made as follows:

Infusi thaeæ virid. fort., ☉ij.; succi. limonis, ℥j.; spir. vini gallici, ℥iv.; sacch. alb., ℥iv.

It is worse than useless to attempt to *feed* cholera patients. The mildest nourishment only adds to the feeling of oppres-

sion and general distress, from which only the act of vomiting gives immediate relief. Still, beef-tea, or consommé, well seasoned with salt, may be tried from time to time; or a little arrow-root, or solution of isinglass, or gum-arabic, with brandy; or a few spoonfuls, from time to time, of milk and lime-water, in equal parts; or milk punch, made with milk, lime-water, and brandy. As a general rule, however, these articles are more useful at a later period.

As the stomach should be allowed to rest as much as possible, injections of two ounces each of strong green tea and brandy; or of strong solutions of sulphate of iron, or of creosote or turpentine, may be tried with hope of success.

Simple soda powders will often relieve the vomiting better than anything else, although full doses of creosote in mucilage and tincture of cardamoms, are often useful.

Hypodermic injections of morphine will often prevent or remove cramps, allay vomiting, check diarrhœa, and produce general comfort.

COLLAPSE.

The preceding stage is usually of short duration; and with the subsidence of the active symptoms, the patient sinks into the third, or cold, or algid stage. The vomiting and diarrhœa cease; the secretions are all suspended, especially that of urine; the shrivelled skin partially relaxes, and presents the coldness of death; the pulse is no longer to be felt, and the beating of the heart is scarcely to be felt or heard.

TREATMENT OF COLLAPSE.

Macpherson says in the stage of collapse he knows no drug worthy of the smallest confidence. The remedies are either vomited, or, if retained, are inert; and if given, as they often

are, in excessive quantities, they become a serious cause of embarrassment, interfering especially with nutrition. Some—and in severe epidemics, unfortunately, a great many—patients will die; but such cannot be saved by pouring drugs into them in the collapse of this terrible disease.

Houston asks, when the patient reaches a state of profound collapse, does anything remain to be done—can the resources of our art furnish any relief? He feels constrained to give a negative reply. Many have recovered from this algid state; but, under his observation, a larger portion recovered of those who were left to the efforts of nature than of those who were actively treated. The patient may lie for many hours equally balanced between life and death, and, if kept warmly covered in the recumbent posture, in rare cases, the skin will gradually lose its deathlike feeling, the dampness of the skin will dry up, the thread of a pulse will be occasionally felt at the wrist, and the face will gradually assume the expression of life. These feeble indications of reaction must be severely left alone; for the brightening spark may easily be extinguished. Nature must be left to finish her own work; an early recourse to stimulants at this critical period has, in many instances, been followed by a speedy return to collapse, and death. Small doses of any grateful cordial, such as curacoa, chartreuse, absinth, &c., frequently repeated, may be admissible; but the principal reliance should be placed on a continuance of diluents and on nourishment. These diluents are of prime importance in the latter stages of the disease. The blood has been rapidly deprived of its more fluid constituents by exosmosis, and diluents are important, not only to allay thirst, but also to arrest exudation, and convert it, if possible, into endosmosis. Hot green tea sometimes comes in play here.

Bowerbank says, in the prisons and hospitals of Jamaica, when the patients refused to submit to treatment, or to take the medicines ordered, the rule was to put the mattress on the floor and to lay the patient there, placing by his side a bucket filled with ice-water and a tin pannikin. For the most part, these patients received little or no further care; certainly they were not rubbed and covered up with blankets, as the more tractable were; but the majority of those left to their own resources got well. Dr. Hutchinson practised during the epidemics of 1849 and 1854. He has seen a number of patients who, left to themselves, went through the collapse and reacted without any treatment, while in a number of other cases the same good result followed the use of ice and beef tea only. Under these circumstances, even the highest dilutions of the homœopathists may honestly be supposed to be useful.

REACTION.

Macpherson says: If opium, lead, calomel, and other severe drugs, have been abstained from, nature starts fair in the stage of reaction, which he is sure is not the case when overweighted with one or the other; or, as he has often witnessed, with all of them. He has seen dangerous reaction, i. e., high fever, with cerebral symptoms and coma; but only when art, coming, not to aid, but to thwart Nature, has interfered with her eliminatory processes, by the too free use of opium, astringents, and such like remedies. In such cases, he resorts to free purgation with calomel, applies ice to the head, and restores the action of the skin by the wet sheet, cold sponging, and the like. When the secretion of urine is long delayed, he has seen good result from the free use of chlorate of potash, and the application of turpentine stupes over the region of the

kidneys. Houston prefers strychnine, gr. j., dissolved in tincture of cantharides, ʒj. Sweet spirits of nitre, and small doses of nitrate of potash, are important remedies against the reactionary fever.

Macpherson says, *as soon as the vomiting ceases*, you must support the patient by proper nutriment. At first he usually begins with thin arrowroot, well boiled, and flavored with a little aromatic, only a teaspoonful at a time, giving every now and then a teaspoonful of brandy in it, and never overloading or overdistending the stomach. Instead of water, he now quenches thirst with milk, containing lime-water, and flavored with a few drops of curacoa; or the milk may be given in soda-water.

As reaction proceeds, he substitutes strong beef-tea, or, better still, essence of meat, using it in the same cautious way, spoonful by spoonful, at proper intervals. Later still, eggs beaten up with a little brandy, and flavored as before, with curacoa, is often relished.

The greatest caution is required not to disgust the patient; not to re-excite vomiting; not to overstimulate, and bring on cerebral symptoms during the febrile reaction.

When patients are thus carefully nursed, it is seldom that reaction is excessive. Nothing but mischief may be expected from over-anxiety to hasten convalescence by too freely pressing food and stimulants on the weakened stomach. It requires a great deal of coolness and patience to understand this, and many cases go wrong from over-anxiety. In many cases of cholera in Jamaica, after the patient had battled through the disease, he died from the effects of a heavy meal of greasy soup.

But it is a great mistake to assume that the severe febrile

reaction which often follows the collapse of cholera is always caused by the abuse of stimulants and opiates. Fever and raging delirium are apt to occur when cold water alone has been used during the whole course of the disease.

ALLIANCE WITH FEVERS.

In the fourth stage of cholera, or that of reaction, the patient is apt to suffer with a severe form of fever, which, Aitkin says, is in no respect dissimilar to, and not less fatal than, the typhoid form of typhus fever. These typhoid symptoms, which are so common in Europe and America, are unknown, or nearly so, in India, where, if a secondary fever ensues, it assumes the form of the remittent fever of that country. But, in a few mild cases, it takes on an intermittent type, sometimes of a quotidian, at others of the tertian kind. Hersch says, it is a well-known fact, that malarial fever has preceded outbreaks of cholera, not only in single places or particular regions, but in an almost pandemic distribution, and there is every reason to believe that malaria and cholera devastate the same ground. Some physicians believe that cholera is in some strange way mixed up with intermittent and remittent fevers in India and the East; and with typhoid fever in Europe and the West. Others have even gone so far as to describe cholera as an inverted typhoid fever; it commences with profuse discharges, and the latter is apt to end with them; the one has collapse before the fever, and the other afterwards, &c.; the causes of both are said to be similar with the difference of climate only.

Lankester also says: There is an endemic and epidemic fever which is supposed by high sanitary and medical authorities to originate in the spontaneous decomposition of organic

matters in drains and sewers ; hence it has been called *drain* or *sewer fever*, but it is generally better known by the name of gastric or typhoid fever. That this disease is generated by a specific poison, has been demonstrated by Dr. Budd, of Bristol, and should it be capable of demonstration that this disease is really developed *de novo* by the matters of drains and sewers, it would be an interesting fact, as showing the possibility of a contagious disease being produced afresh. Tanner and Murchison wish to change the name of abdominal typhus, or typhoid enteric fever, into *night-soil fever*, or *pythogenic fever* (literally, " born of putridity"). Tanner says, it is generated by putrifying animal matter ; the effluvia from foul drains, or the contamination of drinking-water, from decomposing sewage making its way into wells, are frequent sources of this disorder. There are many facts which show that enteric or typhoid fever often arises from bad drainage ; the danger is greatest when the drain or sewer becomes choked up, and the sewage stagnates and ferments ; there are numerous instances of enteric or typhoid fever appearing in houses having no communication by drains with any other dwelling, e. g., in isolated country houses. Tanner continues : Allowing, therefore, that enteric fever is generated spontaneously *by the decomposition of sewage and fæcal matter*, we should expect to find it most prevalent after the long heat of summer. The attack may occur immediately on exposure to the miasm, especially where the latter is concentrated, with vomiting and purging, so that such cases have sometimes given rise to a suspicion of poisoning, as in the case of the National hotel at Washington, D. C. Even in milder cases, there is a tendency to both sickness and diarrhœa in the early stages ; but almost always there is diarrhœa, which generally increases towards

the end of the second week, so that there may be then eight or ten stools a day, which are also remarkable in being alkaline (instead of acid as healthy ones are), of a putrid character, and for containing a large quantity of ammoniao-magnesian phosphate.

Some medical men have supposed that occasionally an alliance takes place between yellow-fever and cholera. They both arise in hot climates, but the one from the decomposition of vegetable, the other of animal matter. Both affect the blood profoundly; yellow-fever the red particles, and cholera the white blood. The hæmorrhagic form of yellow-fever has been called the *hæmo-gastric* pestilence, from its tendency to profuse simultaneous effusions of blood from various parts and organs. Cholera has been termed the *hydrorrhagic* or sero-intestinal pestilence, from the profuse discharges of the serum of the blood, primarily from the bowels, and subsequently from the stomach and skin, which characterize it.

SPECIAL REMEDIES.

ICE.

Cold checks cholera, and is a preservative and disinfectant. Bodies greatly cooled cannot decay, and animal matter seems capable of being preserved to endless time by cold; witness the frozen elephants and mammoths of Northern Russia, which have remained for ages. Ice has proved highly efficacious in cholera. When employed alone, the mortality was only thirty per cent., which is very low, compared with cases in which stimulants and opiates were employed. It relieves, in a remarkable manner, the burning heat at the pit of the stomach and the insatiable thirst; it arrests the vomiting, and contributes greatly to excite reaction. Although it is a remedy of the highest promise, it will probably not prove as useful in America as in Europe, for we are accustomed to its daily use. In addition to chewing and sucking it frequently, a bit should be swallowed immediately after each dose of medicine.

Johnson says there is no evidence to prove that the application of *ice to the spine* has been useful in any case. It is only certain that some patients will recover in spite of it.

COLD WATER.

This was first proposed and carried into practice by Dr. Shute, of Gloucester, from whose experience and that of others it seems certain that the free internal use of cold water is productive of the most beneficial effects, and that when it is withheld, the rate of mortality has been much higher than when it is allowed. Wherever cold water formed the base of the treatment, the ratio of deaths was very much lower than when

stimulants, and, in fact, any other remedies, have been employed. Dr. Shute says, under the cold water system the state of collapse is sometimes prolonged to two, three, or four days; and others have remarked that during the reaction a paroxysm of raging delirium is apt to occur. It is not, therefore, an inoperative system. The cold water is supposed to act by supplying to the blood the serum it loses by the intestinal evacuations; also by taking up the urea, determining to the kidneys, and relieving the blood of the presence of this poisonous agent. When water is used it should be as cold as procurable, and preferably *iced;* it should be taken in large and repeated draughts, and although for the first four or five times it may be rejected, its use should be persevered in. It soon remains on the stomach, and when this is effected, a beneficial change in the state of the patient is soon observable. The intense thirst which usually accompanies cholera, would alone justify the adoption of this treatment. Whatever other treatment is adopted, cold water in copious draughts will prove a valuable auxiliary, perfectly safe, agreeable to the patient, and likely to be productive of the best effects.

HOT WATER AND DRINKS.

Ice water relieves the sensation of heat, and it has a powerful influence in checking vomiting before and during *impending* collapse, but are these sufficient reasons for giving iced water to a patient in *full* collapse? In Johnson's opinion they are not. He is sure that vomiting, when not excessive, is beneficial, and he believes that ice-water lessens the vomiting and the burning sensation in the stomach by diminishing the vascularity of the mucous membrane, and thus interfering with the excretion of the morbid poison, upon the ejection of which

the patient's recovery depends. For these reasons, he believes that the administration of ice-water to a patient in collapse is injurious. In most cases he would allow an unlimited quantity of water of the temperature of the room; but in *extreme collapse*, he would persuade the patient to drink *hot liquids*, with a view to add some warmth to the blood. Hot fluids should then also be injected into the bowels; and if the kidneys act scantily, or not at all, the bladder may be injected full, from time to time, with warm or hot fluids. In deep collapse, Stevens' saline solution, heated to one hundred or one hundred and twenty degrees, has often been injected into the veins; always with temporary, and occasionally with permanent benefit; although the interior of the body in full collapse is so chilled that when these injections return they are quite cold. The stools and vomits in full collapse are quite cold; and when Cæsarian section is performed immediately after, or just before death, the fœtus and uterus are found equally cold. Hence the use of hot fluids and injections seems rational. I would suggest very hot injections of a strong solution of sulphate of iron. This is one of the best disinfectants, tonics, and astringents, and will also tend to remove the deeply venous and asphyxiated condition more than any other remedy. Hot green tea, with brandy or rum in it, has been successfully used in Paris.

HEAT.

The royal committee say, the application of *heat* to the surface in various ways has been largely tried, and it appears to be the uniform experience of the profession, that in collapse this means is of but little value. The whole tendency of the evidence yet acquired for the treatment of this stage is towards a more restricted use of poweful excitants of this kind.

Annesley declares that the warm bath does more harm than good; the fatigue arising from going in and coming out of it, and from rubbing and dressing the patient, exhausts him. Christie found the bath injurious. Parkes did not see a single case in which the warm bath appeared beneficial, and he has seen a man walk firmly to the bath with a pulse of tolerable volume, and a cool, but not cold skin, and seen the same man carried back in five or ten minutes with a pulse almost imperceptible, and a cold clammy surface. Johnson says, while the *hot-air bath* appeared to relieve the cramps and sometimes improved the pulse, yet on the whole the patients appeared to be distressed rather than comforted by it. Still there can be no question that to thoroughly warm a patient in collapse is often a real benefit, for the pulse, temperature, and color of the skin, and the expression of the features, all improve simultaneously. A very convenient and safe way of keeping up the warmth of the body is by the application of hot bottles, hot dry flannels, and hot sand-bags, to various parts of the surface. Slacking several pieces of quick-lime placed on plates in the bed, is a rapid, convenient, and the most efficacious way of producing great warmth without disturbing the patient or injuring his skin. Macpherson says most emphatically that the parboiling system has had its advocates, and hundreds of living East Indian practitioners can testify to the fatality, to say the least, of this method, even when mustard has been added. To take a man in the collapsed and pulseless stage of cholera, out of the horizontal position, where alone there is hope of safety, and to plunge him in this condition into a bath heated to the highest bearable degree of temperature, short of scalding, to which mustard in large quantities has been added to make it more stimulating, is about the surest method

that can be taken to exhaust the little remains of vitality left. Experience has abundantly proved this; for so many men have actually perished in the baths that the practice has long since been abandoned in India. But all dirty patients, even if deeply collapsed, should have one thorough salt or chlorine bath to thoroughly cleanse and disinfect their hair and skin. Still the patient should never be allowed to assist himself. He should be lifted in and out, and helped in every possible way. Flannels soaked in hot mustard-water may then be wrapped around his body and limbs.

SALT WATER.

Bowerbank, of Jamaica, thought he saw more good from the use of Stevens' powders than from any other mode of treatment; in fact, in 1854, he confined himself chiefly to these. Having read of the use of *sea*-water in the treatment of cholera, and from the difficulty of getting the powders, Dr. Campbell and himself concluded to give sea-water a trial among the prisoners of the general penitentiary at Kingston, Jamaica. They had buckets of sea-water brought from a distance from the shore, and this well iced; it was doled out in small quantities to the sufferers, who drank it greedily, and, strange to say, of seventeen cases who took it, all recovered. Unfortunately it was not tried till towards the decline of the epidemic. In almost every case, after the fourth or sixth dose, the alvine discharges became tinged with bile, as also the contents of the stomach vomited. From the results of this experiment, he has made up his mind to give sea-water another fair trial if he ever witnesses another epidemic. In fact, if attacked himself, he would rely on the saline treatment and sea-water well iced.

SALT.

This is one of the best antiseptics and disinfectants. Waring thinks there is but little doubt that salt is of the highest value in cholera; but says the fact must not be overlooked that cold water *ad libitum* was allowed in addition; and in all cases in which cold water was used freely the mortality has been less than when it was withheld. The patient may be placed in a hot bath at one hundred and twenty degrees, in which fourteen to twenty pounds of salt is dissolved. Injections of hot salt water into the bowels are said, by Stevens himself, to be more reliable than injections into the veins, in full collapse. Stevens, Venables, Pidduck, Hastings, Goodrich, and others, gave two tablespoonfuls of table salt, dissolved in four to eight ounces of cold water, repeated every quarter of an hour, until free vomiting was produced, and then cold water in large draughts was advised to allay the insatiable thirst and heat of the stomach caused by the salt. Beaman gave three tablespoonfuls in half a pint of cold or tepid water. It restored the secretion of bile, diminished the cramps, increased the fulness of the pulse, and the voice became stronger and the strength greater; but in twenty or thirty minutes the pulse may begin to flag, strength decrease, and cramps come back, when the salt must be repeated a second or third time. The latter is rarely necessary. Thus given, salt often produces vomiting in less than one minute. Of six hundred and seven cases treated in this manner only one hundred and twelve died, or about twenty per cent. Hastings lost sixteen cases out of sixty-two under the salt treatment, and double that number when he used opium and stimulants; but Goodrich lost the whole of twelve cases in deep hopeless collapse. Pidduck gave as much as from four to eight ounces of table salt in a

small quantity of water, or nearly a saturated solution, in eighty-six cases of full collapse, with a loss of only sixteen.

SALINES.

The saline treatment is based upon the attempt to restore to the blood the fluids and salts which have been poured out in the profuse cholera discharges. It is evident that at best this can be but palliative and auxiliary. All the water and salines which are drank, and injected into the bowels, bladder, and veins, will be simply poured out again until the hydrorrhagia from the stomach and bowels is controlled. It is not until absorption begins again that any good can result from their employment.

ALKALIES.

One of the most striking features of cholera is, that all the discharges are acid—none have ever been found to be alkaline; the stools are acid as well as the vomits; and the blood itself, which is naturally alkaline, becomes neutral, and even acid. Wakefield treated upward of one hundred and fifty cases of choleraic diarrhœa, with thirty grains of sesquicarbonate of soda, in a wineglass of strong mint tea, every half hour. He says no fatal case occurred—the disease was arrested with almost magical rapidity; and he rarely had occasion to administer more than three doses before the nausea, vomiting, and diarrhœa, were arrested. The patient was confined to a diet of beef tea, cocoa, or arrowroot. No solid food—not even bread—was allowed. We have already quoted Bowerbank's experience with soda and ginger.

Beaman gave carb. soda, one half drachm, in two or three ounces of water, with the addition of four or five teaspoonfuls

of fresh lemon juice, taken while effervescing, every hour, for three or four doses; then every four hours. For forty-eight hours he gave no other medicine. Generally, on the day after the attack, the patient passed a small fæcal evacuation, containing bile; if he did not, a few grains of rhubarb, aided by the sulphate of manganese, may be administered; or inspissated ox-gall, or aloes. The patient may drink as much water, or toast water, cold or tepid, as may be wished, and no other beverage. For the next twenty-four hours, Beaman gave only weak black tea and thin arrowroot; on the next day, broth or light meat.

The saline treatment is almost similar to the alkaline. Stevens gave: sodæ carb., ʒss.; sodii chlorid, ℈j; potass chlorat., gr. vij.; every fifteen or sixty minutes. The quantity of chlorate of potash is ridiculously small.

ACIDS.

Notwithstanding the acid condition of the blood and all the secretions in cholera, the treatment by acids, especially *sulphuric acid*, is almost the fashionable mode now. Fuller first introduced it in the treatment of English cholera, in which it is doubtless more useful than in the Asiatic form. Still, McCormac put a stop to an epidemic in the Belfast Asylum by administering a daily dose of a drachm of dilute sulphuric acid in an ounce of peppermint water. No subsequent cases occurred. Dr. Worms, chief of the military hospital at Gros Caillou, in Paris, relied altogether upon it in 1865, in half-hourly doses. It may be given in barley water, thin arrowroot, or syrup of raspberries, lemons, or ginger. It is apt to injure the teeth, unless the mouth is rinsed immediately with a solution of soda. Elixir vitriol, and the muriate tincture of

iron, given in glycerine, or syrup of ginger, are said to have succeeded when the other failed. Still, I think alum or iron-alum will be found far more safe and useful, although sulphuric acid is said to be not only a disinfectant, but a styptic, and to cure the white-blood hæmorrhage of cholera in the same way that it does red-blood hæmorrhage. Phosphoric acid is more pleasant and useful, and does not injure the teeth.

EMETICS.

These are rarely given until the stomach is involved, and then they are washed away by the outpouring tide of serum. The large doses of ipecac. and tartar-emetic given by some physicians are generally as harmless and useless as the small ones given by the homœopathists. At one time Mustard emetics were much employed, but were soon discarded, as experience proved their injurious influences in the stage of collapse, for then they frequently failed to produce vomiting, and their retention during the stage of reaction, in the form of an internal mustard-plaster on the delicate lining membrane of the stomach necessarily produced much evil. Table salt is far preferable.

Ipecac.

Ipecac. has been given in quarter grain, or small nauseating doses. Some homœopathists give one twentieth grain, or like Vehsemeyer, from four to ten drops of the tincture every quarter, half, or one hour; others, like Reil, say, it is useless against the premonitions of cholera. Waring says, the mortality has been very large under its use, when given in full emetic doses. Others say, it has been given successfully in five or ten grain doses every five or ten minutes. It causes violent attempts at vomiting, but after three or four doses

tolerance is established. In the Paris hospitals, in 1865, ten to twenty grains of ipecac. were given whenever there was much vomiting.

Tartar-Emetic.

This remedy has been used in cholera, although Wood, and Surgeon Mills, U. S. A., say, the symptoms are more like those produced by an overdose of tartrate of antimony than anything they can compare them to. Kurtz, and other homœopathists, use teaspoonful doses of a solution of one-grain, in one or two ounces of water. Others says, that one grain doses every twenty minutes have been given successfully; or tablespoonful doses every half hour, of a solution of four or five grains in four ounces of water. Billings, and others, gave three-grain doses every hour, followed by one grain, of opium, and claim that they only lost four cases out of twenty-one, or nineteen per cent.; while under calomel the loss was thirty-six per cent.; and under stimulants, fifty-eight per cent. Littleton gave five-grain doses every twelve minutes till the vomiting ceased; then forty to fifty grains of calomel. When the full flood of the disease is going on these dangerous doses are washed away and do neither harm nor good. But when this tide is stopped they become deadly; thus, in Colonel Pearie's French regiment of one thousand men, seven hundred died in six days, under full doses of tartar-emetic.

PURGATIVES.

Dr. Davey assumes that purgatives do not act as such in cholera, but restrain the diarrhœa, and effectually check the intestinal discharges; they act as restoratives of the normal character of the secretions, and establish healthy fæcal discharges. He prefers calomel and ext. coloc. co., taken fre-

quently and alternately with a mixture of castor-oil and turpentine. Aitkin says, the action of cholera most nearly resembles that of Elaterium, or the squirting cucumber. Thus, during the period of transudation, which only lasts about thirty-six hours, the water of the blood passes off before the solids of the serum; then the salts, before the organic solids, such as albumen and fibrin; the chlorides, before the phosphates; the salts of soda before those of potash. It is interesting to note that this order of expulsion is very much the same as that caused by the action of elaterium. Very soon after the constituents of the serum, or white blood commence to run off, an important change takes place in the red blood; the contents of the red globules transude into the serum, the water passing out first, then the salts, then the chlorides and soda salts, and lastly the phosphates. The blood globules are left shrivelled and dark.

One would suppose that purgatives would be carefully avoided in this disease. But McGregor has given three doses of five drops each of Croton oil, combined with three-grain doses of opium; he says the vomiting and purging will cease, the cold and clammy skin become warm and moist, and the tongue and expired air will no longer be cold. Thorne regards Croton oil, combined with opium, as an invaluable remedy, which will arrest many cases of vomiting, purging, and cramps, at once. McPherson says Croton oil and opium pills were once regarded as infallible: they are not so now. As turpentine enemas were also used, it is to be supposed that they and the opium prevented the otherwise deadly effects of the Croton oil. But the tolerance of such large doses only proves how low the vitality of the stomach and bowels sinks in severe cases of cholera and collapse. No one, not even the

homœopathists, have ventured on the use of elaterium. The latter rely upon veratrum, although Vehsemeyer says it is useless, both when given in dilutions and massive doses. Schweick lost ten cases out of thirty-three, with it.

Castor Oil.

George Johnson claims to have cured twelve cases out of fifteen, in collapse, with ʒss. doses of castor oil, every half hour, till twenty-two or fifty-four ounces had been given; but other physicians lost eighty cases out of one hundred and eight. As the tongue is cold in collapse, and the sense of taste not very acute, there was no difficulty in giving it in ice-water. But he gave cold water *ad libitum;* also, an occasional emetic of salt, which seemed to rescue some of the castor oil patients from an almost fatal lethargy; and two-drachm doses of spirits of turpentine occasionally, as a wholesome stimulant during the stage of icy coldness; and applied large mustard-poultices over the abdomen.

Calomel.

This has been given because it was assumed that there is a suppression of bile in cholera. But the gall bladder is always full in this disease; and Parkes and Simon have found that bile is always present in the cholera evacuations, but in a modified form; heat and nitric acid together will always render it manifest. Stillson, of Malta, gave twenty-grain doses every half or one hour during the stage of collapse; in all, he administered eighty-seven thousand grains to three hundred and seventy-three patients. One man took eleven hundred and sixty grains and recovered; but the mortality was fifty-two per cent., or about the same as if no medicine at all had been

taken. Drs. Ayre and Peacock gave one or two grains, with from one to five drops of laudanum, every five, ten, or fifteen minutes, and lost three hundred and sixty-five cases out of seven hundred and twenty-five. Macpherson says calomel has been used to fulfil every indication in turn, according to the peculiar belief of the prescriber. Some gave it as a purgative, others as a sedative, and not a few as an alterative; or to stimulate all, or many of the secretions; or to stop the vomiting. Then a numerous class gave it for no reason in particular. It was the so-called trump card in their hands, and, like ordinary whist-players, when in doubt, as men are apt to be when dealing with cholera, they played trumps, *i. e.*, gave calomel. He has seen it given in every conceivable way, and for every possible and impossible end; in grain doses every half or one hour, and in scruple doses, again and again. It is of no use during the collapse, but by-and-by, when the powers of life begin to revive again, the first thing the system has to do is, to contend with and dispose of more or less calomel. One of the first results is very often vomiting of that green paint looking matter, which is so hard to stop; or bilious diarrhœa is excited, which may soon bring the case to an unfavorable end. At the best, it disturbs the stomach and interferes with nutrition at the very time when nature needs the wisely cautious helping hand of the physician to assist her when struggling for existence, and when she should not be searched and goaded with powerful drugs, prescribed no matter with what intention. If given during the collapse it accumulates like water behind a barrier, and when the functions begin to be restored, and the barrier gives way, nothing but harm results. Why, says Macpherson, concentrate all our attention upon the bile? Why not stimulate the kidneys also? Is the biliary secretion

any more in abeyance than this, or any other secretion? Macpherson thinks these pertinent questions; and recommends all, to put them to themselves, when tempted in moments of doubt, or enthusiasm to prescribe wildly. If given at all, it should be combined with large doses of camphor.

ASTRINGENTS.

Macpherson says, no class of remedies have been more used in cholera; the great anxiety has ever been to restrain the evacuations. Yet he is persuaded that mere purging rarely kills, and in the most fatal form of cholera there is no purging, or very little. He might as well assume that no one ever bleeds to death; and he knows full well that internal hydrorrhagia is as fatal as internal hæmorrhage. Still he thinks that nitrate of silver deserves a more extended trial, for in one epidemic he found it exceedingly useful as an astringent in excessive purging. Some of his native pupils used it extensively during the same epidemic in Hyderabad, and with so much success as to gain for themselves considerable reputation. He used it again in the following year with disappointing results—another proof of the varying constitution of epidemics. Garlike used, successfully, injections of sixteen grains of nitrate of silver in four ounces of water, thrown high up into the colon by means of a flexible tube. Others, give one grain of the nitrate in a pill, with or without a quarter of a grain of opium every hour, for four or six doses.

Tinct. Ferri Muriat.

Hancom says the principal effect produced by cholera poison appears to be an *atony* of the secretory and excretory ducts and mucous follicles; it therefore follows, as a natural

indication, to restore power and tone to these vessels as speedily as possible, and this is best effected by the administration of styptics. His sheet anchor in real Asiatic cholera was the muriate tincture of iron, in as concentrated a form as possible, given immediately after every dejection; its immediate effect in reducing the quantity of fluid ejected was truly astonishing, and this gradually diminished after every dose, until it ceased altogether, and a cure was effected. The evacuations become black after a while. He also used a liniment of strong sulphuric acid ʒj., olive oil ʒiss; and the hot air bath, by means of a small spirit lamp, and an apparatus under the bed clothes. He strongly urges the avoidance of brandy, and large doses of opium; for they both do more harm than good. The agonizing thirst and intense heat in the hypogastric region, he thinks, is best allayed by the free use of iced soda water, and iced champagne, or small pieces of ice retained in the mouth and swallowed occasionally.

Sir James Murray gave from five to ten grain doses of iron-alum in mint, or some other aromatic water. Sulphate of iron, pernitrate of iron, gallic acid, tannin, and matico, deserve attention. Tinct. matico in ʒss. to ʒj. doses, is said to be very useful. Turpentine, and kreosote, and the aromatic elixir of ergot should not be forgotten.

Acetate of Lead.

Although the *tonic astringents* should commend themselves to every one, the *sedative astringents* have been far more frequently used. The latter may be allowable in the earlier stages of the disease, but become dangerous or useless in the more advanced periods. Graves first recommended plumb. acet. ϑj.; opii gr. j.; and confect. rosæ q. s., to make twelve pills;

one every hour. Thorne found gr. ij-iij. of the acetate with one eighth grain of morphine, a most valuable remedy for checking the profuse watery dejections. Houston says, every practitioner is prone to settle down upon some favorite prescription, and the following is the one upon which he finally relied with most confidence, after having given a fair trial to many others: Acet. Plumbi, gr. xxiv.; pulv. camphoræ gr. xxiv.; morphine gr. ij-iij.; olie cinnamomi gutt. v.; mucilage q. s.; make twelve pills, and give one every two, three, or four hours. It is chiefly applicable to the premonitory stage, and it is asserted that nearly every case will recover under its use.

Copper.

Dupuytren relied on acetate of copper. Neligan recommended:

Cupri sulphat gr. vj.; myrrhæ gr. xij.; conserv. rosæ ℈ij.; make twelve pills and give one every one, two, or six hours. Joy advises:

Cupri sulph. gr. ss.; opii pulv. gr. ss.; confect. rosæ q. s., to make one pill; to be taken from three to six times a day. The homœopathists rely much upon small doses of copper, or cuprum, especially in the spasmodic stage, although some of them give it in doses of one tenth of a grain.

STIMULANTS.

Waring says, these were formerly considered an indispensable and invariable resource; but of their real value many doubts are entertained at the present day. It appears certain that the indiscriminate use of stimulants, especially the more diffusible ones, as brandy, if given in very large quantities, and in a concentrated form, so far from being beneficial, are

often actually injurious. Whenever excessive stimulation forms a prominent part of the treatment, the ratio of deaths is increased. Thus, under ipecac. alone, the deaths were fifty-seven per cent.; when combined with stimulants, they rose to sixty-seven per cent.; and in the case of ice, stimulants increased the mortality from thirty to fifty per cent. Excessive stimulation must tend to exhaust the diminished nervous tone; and there are few points in medicine which require more care and discrimination than the selection of the proper cases and proper periods of administering stimulants in cholera. No rule can be laid down, except that it is certain they should not be given in the excessive quantities formerly prescribed and advised—they should be given more or less largely diluted; and should not be trusted to alone.

Macpherson says, stimulants, both of a medicinal and alcoholic kind, have been much resorted to in cholera, and very naturally. The prostration of the powers, both of the circulatory and nervous systems, is so extreme that we cannot wonder that strenuous efforts been made to rouse and sustain them by the free use of remedies of this class. Yet, he thinks that those who have used them most, if observant and candid men, must admit they have not answered their expectations; at the least, all must allow they require to be given with a cautious hand. They are useful when given at the proper time and in the right way; he does not think they are of any use during the collapse, when at first sight or thought they might appear most appropriate or necessary.

Houston says, when the patient is not seen until the commencement of the second stage, the symptoms seem to demand the use of the most powerful stimulants and anodynes, and it is here that the physician is called on to exercise all his for-

bearance, and display all his decision of character. Having used himself, and having witnessed in others, the use of every variety of stimulants, and in all doses during the second stage, he was forced to the conclusion, that, as a general rule, they did no good, and in many cases did positive harm. Their effect often was to depress still further the already waning organic sensibility, and, even in the few cases where this sensibility was aroused by these means and reaction produced, it was too apt to end in fatal congestion of the brain. This happened in many cases treated in the early part of the first epidemic. When feeble signs of reaction from collapse occur, they should not be interfered with; Nature having commenced, must be left to finish her own work. The renewal of stimulation at this period, has, in many instances, caused a speedy return to collapse and death. The principal reliance should be placed on a continuance of diluents, and the introduction of liquid nourishment as soon as the appetite calls for, or the condition of the stomach will bear it. Bowerbank is quite certain that, in the epidemic of 1850, in Jamaica, he saw much mischief done by the use of spirituous stimulants and opiates, so that, in the epidemic of 1854, he almost entirely banished these remedies from his practice. George Johnson says, again and again, he has seen a collapse-patient grow colder, and his pulse diminish in volume and power, after a dose of brandy, and apparently as a direct result of the brandy.

Yet all these physicians give stimulants occasionally. Macpherson prefers small quantities of brandy or curacoa; Houston, small doses of any grateful cordial, such as Absinth, or Kümmel, perhaps. In Paris, in 1865, green Chartreuse was largely relied upon. It is said that, in the Hotel Dieu and the Hospital Lariboisiere, one in three recovered after having

reached a very advanced stage of collapse, before reception, under the free use of rum and hot tea; in the proportion of one hundred and twenty-five parts of Jamaica rum to eight hundred and seventy-five parts of strong and hot green tea.

In the earlier stages of cholera, small quantities of stimulants may or may not be used. As the disease progresses, the quantities may be cautiously increased, and should always be given in some vehicle, like gum-water, orgeat, milk and lime water, green tea, or beef tea. When the full tide of the colliquation is going on, the largest quantities and strongest varieties are swept away like water, and are neither useful nor injurious. In the full collapse, when all discharges have ceased, and absorption has not commenced, brandy, hartshorn, and red pepper, lie as inert as flour and water. But, when reaction and absorption begin, if very large quantities of active stimulants have accumulated in the stomach and bowels, the patient will die, as if poisoned with pint (or quart) doses of alcohol; his face will become turgid and livid, or deadly pale and sunken; vomiting may follow, with involuntary discharges of urine and fæces; the pulse may become small and frequent, or slow and laboring; and general insensibility, an apoplectic sleep, spasm of the muscles, coldness of the extremities, hurried, irregular, or sterterory breathing, and all the signs of venous congestion and asphyxia will appear.

Turpentine.

As a stimulating astringent, Surgeon Major Mudge, of the Madras army, made a trial of turpentine, in an egg emulsion, with an aromatic; and in a number of cases found it more than answer his expectations. It does not seem to have caused vomiting, or even nausea, although it is generally a nauseous medicine.

Ammonia.

A Dr. Anderson claims to have cured over one thousand cases of cholerine and cholera, with drachm doses of the aromatic spirits of ammonia, every half or one hour, in a claret-glass of seltzer, or some other sparkling water. If he had said ten cases, or one hundred, one would feel more inclined to believe him. George Johnson says, in a few cases he gave carbonate of ammonia with apparent benefit, and thinks it deserves further trial as a stimulant during the stage of collapse. Surgeon Abadie, U. S. A., says, that aqua-ammoniæ in drachm doses, diluted in a few ounces of brandy toddy, with sulphuric ether, proved advantageous. Dr. Burgess used *Phosphorus* successfully in several cases of the lowest collapse.

TONICS.

The best, are: quinine, sulphate of iron, nux vomica, and strychnine.

Quinine.

Von Graefe and Schlegel have used it successfully as a prophylactic. At Rangoon the treatment of cholera was by large and repeated doses of quinine, but without any encouraging success. The fact is, that while the vomiting is urgent, the quinine is only flushed away and wasted. But when the powers of life were just beginning to fail, small doses of quinine, washed down with iced soda-water, or an ordinary effervescing draught, appeared advantageous. When larger doses were given, the first few might be vomited away, and the patient seem in more or less danger for forty-eight hours, but then strong-smelling evacuations and discharges of urine would occur for the first time, followed by febrile reaction, with con-

gestion to the head; but a more or less speedy convalescence would ensue. Sargent treated seventeen collapse cases, with thirteen recoveries.

Sulphate of Iron.

In the earlier stages, and during convalescence, grain doses of quinine, with two or three grains of sulphate of iron, have been used successfully, when aided by two to four, or six ounces of beef broth occasionally. In collapse cases, grain doses of sulphate of iron four times a day will not suffice, as Sargent lost three cases in succession.

Strychnine.

C. E. Jenkins gave strychnine, gr. j., and conserve of roses sufficient to form eighteen pills; one to be given every quarter of an hour, and washed down with copious draughts of cold water, which the patient will greedily and gratefully imbibe. The first three or four pills will probably be ejected, but the subsequent ones retained, and their good effects speedily perceived. The strychnine being the most powerful tonic known, acts in that capacity on the prostrate nervous system; and the cold water, in the first place, replaces the loss of the fluids, and in the next, by its coldness, constringes the papillæ of the mucous membrane, thus suppressing their outpourings; and, lastly, by its volume it distends and gives tone to the otherwise empty and flaccid intestinal tube.

It was used in forty-seven cases by Dr. Lee; in moderately severe cases, it controlled the discharges without producing, like opium and other stimulants, a subsequent violent reaction.

Nux vomica and strychnine may act in another way. George Johnson says if we carefully observe the condition of a patient in collapse, we will often find that the intestines are more or less distended with fluid; and this, too, while perhaps there is a general torpor, and very little effort at expulsion. In this condition, those remedies which act so powerfully and specifically on the muscular system, may stimulate the muscular coat of the bowels to contract, and not only force out of the body the fluids which have already been poured out of the blood-vessels into the alimentary canal, but may bring on a tonic contraction of the intestinal capillaries, and thus check a farther drain from the blood.

In the collapse stage, Houston, of Richmond, says there is one remedy on which, from past experience, he should be disposed to place much reliance in the future; he alludes to a solution of strychnine, in tincture of cantharides; one grain to the ounce. In the epidemic of 1847, he saw several patients apparently snatched from the brink of collapse by the use of this combination; he gave ten drops, every five minutes, in a teaspoonful of brandy and water, till improvement occurred, and then at longer intervals. The effect was too prompt, and was produced too often, to be considered accidental. All remedies, to do good in cholera, must act either by putting a stop to the liquid drain from the blood and chyle bearing vessels, or by exciting to increased power and activity the great ganglionic centres. Now, strychnine, says Houston, is known to act more promptly and powerfully on the nerve centres of animal life than any other article of the materia medica, and it is fair to presume that, either directly, or through the animal centres, it may produce a like powerful effect on the organic centres.

When the looseness was troublesome and continuous, tending to dysentery, as is so common *after* an attack of cholera, Bowerbank, of Jamaica, found strychnine of much service, either alone or in combination with iron. He generally gave Marshall Hall's formula.

NARCOTICS.

Opium.

Large doses of opium change the arterial blood into venous, and produce that state of coldness, blueness, lividity, and asphyxia, which prevails in the collapse of cholera. Small doses, especially when combined with larger quantities of camphor, ammonia, oil of cajeput, tincture of cardamoms, capsicum, &c., may occasionally be allowed.

Macpherson declares that no remedy has been more used or rather *abused*, than opium, and that most East Indian practitioners have abandoned it as treacherous and dangerous. He earnestly cautions against its use, for it is useless, even if retained, during the stage of collapse; but when reaction sets in, the opium, previously inert, begins to be absorbed and act, and at once becomes a serious hindrance to the restoration of the secretions; and if the quantity has been large, it often hastens on cerebral symptoms, ending in coma. These are its dangers, without, so far as he knows, or ever could discover, a single compensating advantage.

Mr. Ross says, either alone, or in combination with calomel, stimulants or antispasmodics were formerly regarded as indispensable in the treatment of cholera. This idea is now generally considered as erroneous, as a very high rate of mortality has followed all those cases in which opium forms a prominent part of the treatment. It has been given, observes Mr. Ross,

with a view of relieving the cramps and spasms, but the internal congestion which it produces has undoubtedly proved injurious. The use of opiates has been carried too far; they have locked up the biliary secretion, choked the capillaries of the brain with black blood, and overpowered and deadened the nervous sensibility, which ought to be sustained by every effort and appliance, as the only meaus left us, in the states of collapse, for rallying the declining powers of the patient. Blacklock regards it as poison in this disease. W. J. Cox says it is quite powerless to check the vomiting or purging, or to relieve the cramps, and is totally inadmissible in any stage, or any dose. Waring says the last opinion is perhaps too sweeping; for in minute doses, as employed by Dr. Ayre, it appeared to have a beneficial effect; but that it is positively injurious in *large* and frequent doses, either alone, or in combination, is a fact that few will be inclined to doubt, after the experience of the last few years.

Waring says, in epidemic cholera the efficiency of opium is no better established than that of the greater number of remedies employed against this fatal malady. There is no evidence whatever that it is beneficial in very severe cases, and scarcely any of the manner in which it exerts its influence in those of a milder type; or what symptoms it palliates, or how far it shortens the duration of the disease. Unquestionably opium has prevented the development of many a case of Asiatic cholera, by subduing those premonitory symptoms which have received the name of *cholerine*. For this purpose, indeed, its value is very great, yet not so much so, as to exceed that of camphor, with aromatic and diffusible stimulants and mild astringents, especially of the tonic kind, such as sulphate or pernitrate of iron, and iron-alum. It is depended upon in a very

small number only of cases of the fully-formed disease, and it would almost seem as if it ought to be omitted in the graver forms of Asiatic cholera.

Morphine—Hypodermic Injection.

Dr. Willis had recourse to the hypodermic injection of morphia as speedily as possible in all cases where the stomach was so irritable and the bowels so loose as to be incapable of retaining anything; he selected a point over the stomach and great ganglia. The most convenient solution is made by boiling five grains of acetate of morphia, in as much distilled water as will make a drachm when cold; he injected twelve minims, or the equivalent of one grain of morphia, with a graduated syringe, repeated at such intervals and in such quantities as the cases required. It was of the greatest service in preventing intractable choleraic diarrhœa from running into collapse, which is not always so easy of accomplishment as most writers assume. Injecting the veins with warm water has a wonderfully reviving power, and although only temporary, enables the morphia to act in advanced stages of the disease. Medicated injections are not useless, and transfusion of blood may be beneficial.

Cannabis Indica.

In an epidemic of cholera in Calcutta, Dr. Goodeve employed cannabis very extensively, and his report upon it was in the highest degree favorable. Dr. O'Shaughnessy states that he knows no remedy equal to it as a general and steady stimulant, in ʒss. doses of the tincture. He has known the pulse and heat return, and the purging checked, by a single dose. It allays vomiting much more certainly than opium, and is not so

likely to lead to cerebral congestion. Dr. Willemein, of Cairo, has related several cases successfully treated by the tincture, in repeated doses of from ten to thirty drops; in one case of collapse, the patient revived immediately on taking the remedy. It stimulates the nervous centres when their influence is all but suppressed, thus actually preventing the extinction of life. Of course, it was not successful in all cases. It is best given in combination with tincture of cardamoms; or in suppositories, combined with sulphate of iron and cocoa butter.

ANTI-SPASMODICS.

Chloroform.

Braithwaite thinks this will prove the most important remedy in the spasmodic stage of cholera, as it has been found to be wonderfully efficacious in relaxing all kinds of spasmodic action, such as epilepsy, tetanus, hysteria, puerperal convulsions, &c., and, in his opinion, the pathology of cholera consists in a tonic rigidity, spasm, or tetanic contraction of nearly all the arteries of the body.

To use chloroform effectually, place the patient in bed in warm blankets, not in cotton sheets, much less in linen ones; give a glass of brandy in hot water, with sugar and spice; apply friction to the body by means of warm flannels, and an embrocation of equal parts of linimen saponis comp., linimen camphoræ comp., tinct. opii., and ext. belladonnæ. Apply to the whole surface of the body bags filled with heated sand or bran. Then place the patient under the influence of chloroform by inhalation, and keep him so, gently, as long as the bad symptoms recur, which they frequently do on its effects ceasing and his regaining consciousness. Give, in the intervals, small quantities of brandy-and-water and thin arrowroot, or

milk, for nourishment, along with milk-and-water, or soda-water with a little brandy, for drink. Avoid everything else in the shape of medicine, and trust to the efforts of nature in rallying from the poison of the disease. Of course great caution is necessary in administering the chloroform, and in not pushing it too far. In some instances the patient will sleep for twenty minutes or half an hour—in others, for several hours; and on waking will again be seized with a return of the vomiting and cramps; then the chloroform must again be resorted to, and the patient kept in a great measure under its influence till these symptoms abate. It may be resumed at intervals for twenty-four hours. The reaction after its use may be so great as to require moderate blood-letting, as occurred to Dr. J. Hill, in two cases, both persons being of full habit of body. A small teaspoonful of chloroform poured upon a towel is sufficient for one inhalation.

Others say, that chloroform should be given as an anti-spasmodic, and not as a stimulant; nor too late, when collapse has too much set in. It is of most service in the spasmodic stage. Although the poison of cholera seems to act primarily on the ganglionic nerves, almost *paralyzing* them, yet at the commencement of the attack the heart and other muscles are in a state of almost tetanic spasm. But this continues a very short time, and if not relieved, is followed by a real collapse. Bleeding, chloroform, opium, emetics, and all other anti-spasmodic and exhausting remedies, ought only to be used when we want to effect relaxation of cramps and other spasmodic action of the arterial system. Hence, chloroform, if used at all, must be used early, and cautiously, and for a short time only. Davies gave it in twenty-two cases as soon as severe symptoms came on, in doses of seven to ten minims every hour, half hour, or

quarter hour, according to the severity of the symptoms; fourteen recovered and eight died. In nine more cases, and thirteen very bad diarrhœas, treated with chloroform, only one died. The diet allowed was nothing but cold milk-and-water, with some carbonate of soda in it, ad libitum. Of fourteen cases treated by Towers, one died. When the doses were given quite frequently, say every quarter or half hour, six cases died in succession; when given only every one or two hours, seven recovered in succession. Chloroform was also given by inhalation, with the effect of relieving the cramps in every instance. It was not carried so far as to produce perfect insensibility. Ultimately, Dr. Davies came to the conclusion that no reliance could be placed on chloroform alone. Macpherson thinks chloroform is the only important addition to our stock of remedies made for some time; he affirms that the *cramps* are best relieved by the use of chloroform in doses of five or six minims (about fifteen drops) in a little water; if the vomiting be excessive, a little may be sprinkled on a pad of lint covered with oiled silk, or guttapercha tissue applied to the epigastrium; or spongio piline may be used. He has given chloroform in this way, both externally and internally, and always with good effects.

It has been successfully employed by Mr. Brady, of Harrow, Plummer, Boynton, and others, in doses of six to ten drops every half or one hour. Mustard poultices, and other counter-irritants, were applied externally. Sargent gave chloroform, camphor, and turpentine, in four cases, and none recovered. It often allayed the vomiting and cramps, but did not arrest the course of the disease.

It was tried at the London hospital, given both by the stomach and by inhalation, but all the patients died.

Some physicians think that the usual doses of chloroform in cholera are too small, and that fifteen, twenty, or thirty drops, or more, can be given at each dose, without danger. They assume that the impression of the remedy on the ganglionic centres in cholera must be rapid and energetic to be beneficial, and, to this end, large doses should be given.

Dr. Gason, of Ireland, gives only three-drop doses every five or ten minutes.

Dr. Brady relied upon: chloroform, ʒj.; spir. terebinth, ℥j.; mucilag. acaciæ, ℥j.; aq. pur., ℥ij. Dose: a large teaspoonful, containing about six minims of chloroform, and forty of spirits of turpentine.

Dr. Henry Hartshorne's prescription is, perhaps, the best: chloroform, ʒiss.; tinct. opii., ʒiss.; spir. camph., ʒiss.; spir. ammon. aromat., ʒiss.; creasot., gutt. iij.; ol. cinnam., gutt. viij.; spir. vin. gall., ʒij. Dose: one teaspoonful to be put in a wineglass of ice-water, and two teaspoonfuls of that given every five minutes, followed each time by a lump of ice.

Chlorodyne.

The wife of an English chaplain, in Paris, has recently obtained notoriety by administering chlorodyne in fifty or sixty cases of incipient cholera, successfully. Johnson thinks it will relieve the cramps, and, by its narcotic action, somewhat retard the recovery of the patient, but concludes that it is much less dangerous than opium and strong astringents.

BLEEDING.

Braithwaite and Bell think cholera consists in a tonic rigidity, spasm, or tetanic contraction of all the arteries of the body, caused by some violent poison acting on the sympathetic

nerve, and all its branches and connections. The small terminal arteries and capillaries being thus spasmodically contracted, the blood is driven inward upon the great veins. When the congestion towards internal parts has reached to such a point as to oppress the action of the heart, yawning first, and then shivering, or a sense of suffocation and pain in the præcordia are the indications of oppressed circulation, and of the commencing effort of the heart to overcome the mass of blood which is stifling it. If by the application of tourniquets to the limbs, *or by bleeding*, part of the blood which is rushing from the extremities to increase this congestion, is prevented from reaching the great veins—then the heart, excited to increased action, is enabled by this relief more quickly to overcome the obstruction and restore the balance of the circulation, and the paroxysm passes off. If not thus mechanically aided, the heart, after a severe struggle to maintain the circulation during the period of spasm or constriction, is at length relieved by this cramp of the capillary circulation passing off itself; and then the heart and arteries, so long excited by the struggle, maintain for a time their increased action after the obstruction in the capillaries is removed, and produce apparent febrile action; presently this excitement subsides, the vessels become relaxed, and sweat succeeds.

All depends upon the period at which bleeding is resorted to. If early in the congestive stage, or just previous to its second accession, it is invariably successful; if just as the congestive stage is passing off, when the pulse begins to acquire a little power, it is invariably fatal. Dr. Bell explains these facts in the following manner. In the first stage the heart is excited to the utmost by distension of its cavities from behind, and opposition to its action by spasm of the capillaries

in front; bleeding gives relief from the pressure, *a tergo*, and probably aids in relaxing the spasm, while at the same time, by relieving the congested state of the great secreting organs, it enlists their sympathies in support of the vital actions; and the power of the heart being unimpaired, can now carry on the circulation with vigor. But in the second stage, the heart's energy is much exhausted, and its vital irritability impaired by long-continued distention; hence syncope and relapse will be the probable effects of bleeding.

George Johnson says, bloodletting has often afforded great relief in the stage of collapse; he assumes that by lessening the over-distension of the right cavities of the heart, it increases the contractile power of their muscular walls. It is most useful when there is rapid breathing with an oppressive sense of suffocation, an almost entire arrest of blood in the lungs, and a cessation of vomiting and purging. Macpherson says, he saw bloodletting employed at one time; he has now entirely abandoned it.

HOMŒOPATHY AND CHOLERA.

In Ruckert's Clinique, or collection of all homœopathic cures which have been reported in, or translated into the German language, from 1822 to 1850, we find that the homœopathists depended upon thirty-five remedies in the treatment of cholera. Twenty-two of these are not homœopathic in any sense, but act as alterative or antagonistic medicines, viz., liquor ammonia, nitrate of silver, arsenic, asarum europæum, belladonna, camphor, chalk, conium, cantharides, charcoal, copper or cuprum, hyosciamus, ipecac., mercury, nux vomica, opium, phosphorus, phosphoric acid, prussic acid, acetate of lead, rhus toxicodendron, secale, stramonium, and sulphur.

Most of these have been faithfully tried in the regular school, with what success the preceding pages will testify. With the peculiarly homœopathic remedies, viz,, Tartar-emetic, Croton oil, and Elaterium, the regular school have made more experiments than the homœopathists themselves.

Knorre abandoned the homœopathic remedies, and gave grain doses of carbonate of ammonia every half or one hour. Reil gave two drops of aqua ammonia every ten minutes. Kurtz gave it on the slightest appearance of approaching collapse, and attributes his principal success to it. Ebers gave six to eight drop doses every quarter of an hour in threatening cases. Steart gave thirty-drop doses, and claims to have saved one hundred and forty-two cases.

Arsenic is one of the most decided tonics, and greatly relied upon in the regular school in chronic and exhausting diarrhœas.

Cuprum or copper, and acetate of lead, are astringents much in use in the regular school in diarrhœa, cholera, and dysentery. Fleischman says cuprum is not useful against the cramps, and Rummel preferred hyosciamus.

Phosphorus is a tonic and stimulant like camphor and hartshorn ; and phosphoric acid is a tonic and astringent like sulphuric acid.

Secale is a styptic remedy which produces powerful contraction of the capillaries, and has been much used by the homœopathists in cholera.

Rhus toxicodendron is an irritant and stimulant remedy like cantharides.

It is fair to assume that all the so-called cures of cholera, with homœopathic doses of allopathic remedies, were merely recoveries.

If the spasm theory be true, belladonna, conium, opium, and stramonium, act as antagonistic remedies, and homœopathists must always fail with them, as their doses will always be too small.

If the elimination theory be correct, there can be no greater objection to the use of hellebore, jatropha curcas, tobacco, and veratrum, than to tartar-emetic, ipecac., and mercury.

We are not in want of remedies against diarrhœa and simple cholera. It is in the algid, ataxic, and full collapse cases that help is required. In these forms, Fleischman and Tessier, who have had the largest homœopathic hospital experience, say that homœopathy is comparatively powerless. Fleischman says, he has tried every remedy again and again, but has little to say in praise of them. Tessier says, the number of deaths generally corresponds to the number of cases of black, algid, ataxic, or collapse cases. During the epidemic of 1849, he only saw one case of either of these forms get well. Hahnemann's method seems to him to be limited to cases of diarrhœa, cholerine, and simple cholera. Tessier says, it seems fair to treat the black and ataxic forms of cholera in the usual manner, inasmuch as homœopathy fails completely in both of these varieties.

APPENDIX.

1.—NATURE OF THE CHOLERA POISON.

The celebrated M. Robin and his assistants at the Histological Laboratory of the Ecole de Medecine at Paris, have succeeded in producing cholera in dogs, by injecting the serum of the blood and the rice-water dejections of cholera patients into the veins, cellular tissue, and windpipes of these and other animals.

If the rice-water discharges were recent, clear, and without color, and if the serum of the blood used for these injections was drawn during the collapse and algic period, the induced cholera symptoms were very marked; for vomiting occurred in twenty minutes, followed by diarrhœa, the expulsion of epithelial debris, coldness of the extremities, labored and anxious respiration, suspension of the urinary secretion, and by albuminuria.

The introduction of a large quantity of these substances into the stomachs of dogs also caused the same symptoms.

Richardson found that the poison of cholera escapes from the infected person in the form of watery vapor, and justly regards this as a discovery of the greatest importance; for when the temperature of the air is low, the fluid excreta condense on the body and on the clothing of the cholera

subject, and the poison is confined and limited in its effects. But, when the temperature is high, the miasm is readily disseminated into the air. This is the reason why cholera always spreads most easily when the temperature is somewhat high, and in crowded places; and if these rooms and places be also filthy, the whole foul air may be converted into a cholera atmosphere. The great importance of free ventilation is thus proven, and still more so from the experiments of Legros and Goujon, who were enabled, by means of an apparatus containing ice and salt, to condense the air of some crowded cholera wards in the Parisian hospitals, and thus procure a liquid which caused symptoms similar to those of cholera, when injected into the air-tubes of dogs.

The discovery of this cholera poison or fluid, in the air of cholera hospitals, brings this disease more clearly in alliance with the infectious and contagious diseases. We know that not only the breath, but the dried perspiration, tears, nasal discharges, and even the furfuraceous scales from measles patients are saturated with the exhalations of the disease, and may convey measles to others. In scarlet fever the breath, pharyngeal and nasal excretions, and the larger and smaller scales of epidermis, may spread the disease about. In whooping-cough the breath and dried expectoration which has clung to the dresses of patients and attendants may be the means of carrying the disease abroad. In small-pox the dried crusts and scabs which cling to the head and linger in the hair, may retain the disease for months. The clothes of all these patients and of cholera subjects, saturated as they are with the dried perspiration or fouler discharges, may retain the poison for long periods of time.

This cholera liquid is comparable in its action to that of an

overdose of croton oil; at least Dr. Greenhow has seen a case in which an overdose of croton oil was given accidentally, and in the short space of two hours the patient had all the appearance of a person in the cold stage of cholera. There were very profuse watery purgings exactly resembling the rice-water stools of cholera patients; the surface was cold, the features shrunken, the fingers shrivelled, the skin *even more blue* than is usual in cases of true cholera, and the pulse thready, and almost imperceptible; the patient had severe cramps, was very restless, and her respiration gasping. Her intellect was unimpaired, and she died in ten hours.

Orfila gives another instance in which there was a general collapse, such as is observed in malignant cholera, with profuse diarrhœa, and death in four hours.

The great similarity of the action of Tartar emetic and Elaterium to that of cholera, has been fully worked out on pages 139 and 140.

2.—RELATIONS OF DIARRHŒA AND CHOLERA.

Prior to the onset of the epidemic in Malta in 1865, there was no prevalence of bowel complaint, either among the military or civil populations. Of the diarrhœa which prevailed during the epidemic, Drs. Adams and Welch describe three varieties. (See English Army Medical Reports, vol. vi.)

1st. The common ordinary summer diarrhœa: characterized by pains in the stomach, foul coated tongue, numerous bilious stools. This was very tractable in its nature, and was caused by hot weather, spoiled fruit, irregular habits, and drunkenness.

2d. There was a diarrhœa not previously existing, character-

ized by painless watery purging, and often accompanied by vomiting of the same character; clear or white furred tongue, depression of countenance, dark rim under the eyes, and exhaustion. It occurred in every degree of intensity, and when severe was classed under "choleraic diarrhœa." But, although intractable, *it evinced no tendency to pass beyond a certain point or assume a more malignant form.* It was very frequent both during the height and decline of the epidemic. Drs. Adams and Welch repeat that this second variety showed no tendency to pass beyond a certain point, if not stopped.

3d. There was a diarrhœa, an intensification of the second kind, and *so completely intractable*, that in sixty-one cases, where every possible attempt was made to check it, *in none did it succeed*, but was invariably followed by full development of cholera—in fact, it was the diarrhœa stage. It must be clearly stated that during no period of the epidemic was the "premonitory diarrhœa tending towards cholera, but easily checked," met with. The second variety showed no tendency to run into true cholera. In its severe form, the third variety was clearly a stage of the disease; and it may be fairly questioned whether a single case was prevented from developing itself into cholera by treatment directed towards the suppression of the intestinal flux.

It is well, however, to treat all minor bowel complaints so as to get any suspicious case under observation and treatment as quickly as possible.

Barlow, of Guy's Hospital, says that the English or summer cholera occurs in most summers, to a greater or less extent, and in greater or less degrees of intensity. In some cases it is a matter of very little moment; in others, the diarrhœa goes on to an extent that is exhausting to the patient; and,

in some few cases, we meet with thirst, suppression of urine, cramps, lividity and collapse, and, in short, the condition of the patient so closely resembles that of one passing into the collapse of true Asiatic cholera, that *it is impossible for any one*, by mere examination of the patient, to distinguish it; the only guide being the character of the prevailing epidemic. Barlow has more than once seen cases of this kind, of which he has said: "If Asiatic cholera were now prevalent, there would be hardly a chance of the recovery of this patient; but, as it is not, I hope, and even expect, that he will do well." And such has been the case in every instance which Barlow has seen, with the exception of aged and diseased persons. The only difference is that the collapse is not so profound as in the epidemic form of the disease, and the rice-water dejections not quite so copious.

In the times of Shakespeare, and even later, English cholera was much more common than now. Then the floors were of earth only; broom and brush were used but little; garbage was thrown down without care, as now in Abyssinia, and allowed to lie and rot till it became so vile that the device was invented of covering it with straw, so that it might be trodden down, as cattle make manure in straw-yards. Finally, when the earth of the floor became over-weighted with putrid matter, the formation of nitre or saltpetre began, and oxygen accumulated rapidly, rendering these houses habitable in a way. On the discovery of gunpowder, the Government sent Petre men to obtain this saltpetre by force. They entered houses without pity, for villanous saltpetre.

Septic cholera can often be distinguished only with difficulty from the Asiatic cases. (See pages 72 and 73.) In Boston a large number occurred in one district, in the immediate

vicinity or directly in the midst of a large sunken area, which was nothing more or less than a pestiferous quagmire, receiving a large part of the drainage of the surrounding vicinity, and the filth of many tenements occupied by the lower classes.

Sir Henry Cooper says the diarrhœa premonitory of cholera is not distinguishable in its history or symptoms from sporadic or ordinary diarrhœa, until all the natural pre-accumulated fæcal contents of the bowels have been evacuated, and the characteristic stools begin to appear.

Carroll, of Cincinnati, says it is often difficult to distinguish between common diarrhœa and the first stage of cholera. If the patient has been exposed to the cholera influence; if the evacuations are lighter in color—resembling dirty water, or soap suds; if they are painless, copious, or debilitating, and occur without imprudence in diet, exposure to cold, etc., he thinks he has to deal with cholera, especially if there is slight blueness of the face and fingers, some coldness of the tongue and breath, as well as of the ears and hands; slight clammy perspiration, and slowness of the pulse.

3.—DISTRIBUTION BY WATER.

Dr. Norman Cheevers, of Calcutta, has given attention to the influence of *impure water* in the development of cholera at the presumed chief focus of the disease, viz., the delta of the Ganges. He shows that the night-soil of Calcutta is deposited in the Hooghly, at mid-stream, at the rate of one hundred and eighty tons a day, and that the river water from two to thirteen miles up the stream is unfit for human consumption. Yet this filthy river water is drunk by sailors in ships moored in the neighborhood. In addition, twenty-two sewers open directly upon the commencement of a soft

muddy bank, on the irregular surface of which much of their contents is retained; and in February, March, April, May, and June, the poison of cholera from this source is in active operation. It is also worthy of note that a sewer empties itself close to each of the principal bathing places, as if the sacred stream was not already poisoned enough by the daily Augean deposit of night soil—the bathers are furnished with a special fountain for themselves. This polluted river has been termed, not too emphatically, the "Maelstrom of Death," and Cheevers says it is idle to talk of unripe fruits, bad lemonade, of Jack's imprudence in exposing himself to the sun, and of his drunken habits, for one draught of this "poison water" will be more fatal than all of them combined. This polluted water converts a harbor of refuge into a port of danger. Of three hundred and ninety-two cases of cholera, taken into one hospital, one hundred and eighty-nine, or almost one half, came from ships. Only nine cases came from a mooring where there was a greater crowd of ships than elsewhere, but out of the way of the filth; while ninety-four and sixty-one cases came respectively from the two filthiest mooring spots.

We can now readily understand why, as long as the character of the water was overlooked, the so-called greatest amount of care did not make it possible to prevent frequent outbreaks of cholera in ships going down the Ganges from Calcutta, nor even occasional outbreaks as long as a fortnight after leaving the river.

"In the Crimean campaign," says Dr. Richardson, "the English Black Sea fleet had seven hundred and ten cases of cholera, and three hundred and ninety-seven deaths, and ninety-one per cent. of these were supplied with water derived from springs

at Baltschick, a spot on which French troops had been quartered while suffering from cholera. These troops had washed their clothing at these springs, and the ground for a great distance around was saturated with their excreta. The remaining nine per cent. of the infected were supplied with water partly from Baltschick; at least, of the crews of three vessels which suffered severely, two positively took in water from Baltschick, and the third probably so. In all ships, except one, which were supplied with distilled water, not a case occurred; and in that one, the water was passed through a foul hose."—*London Medical Times and Gazette*, July 28, 1866.

In 1866, the little town of Amiens suffered more severely than any other known place. It was ravaged by the most terrible outbreak of cholera that has ever visited any European city. It raged most in the lower town and old city, carrying off whole families when it once entered a habitation. The backs of the infected houses mostly opened upon the river Somme and its numerous tributaries. There the people were constantly engaged in washing filthy baskets, rinsing linen, throwing out slops, or ladling up water to be carried in-doors. The water is still used for domestic purposes, although it is plain that it is fouled most abundantly by sewage matters, and before the outbreak of cholera it was used for drinking. Police officers have seen the people drinking it often and often.

"In 1832, one thousand cases of cholera occurred in Exeter, England, with three hundred and forty-seven deaths. The water was supplied at that time from the river, and was contaminated. In 1834, the water supply was improved, being drawn from the river two miles above town, and in 1849

there were only forty-four cases, and those chiefly among strangers.

"In Dumfries, Scotland, in 1832 and 1849, the supply of water was both scanty and impure, but then a better supply was obtained, and in 1854 the place was very lightly visited.

"In 1866, six districts in East London were supplied by the East London Company, and every one has been ravaged by cholera; from nine hundred to one thousand cases occurring in one week, whilst the remaining thirty-one districts have been comparatively unharmed.

"A woman lodging at the top of a house in Red Lion street, Wapping, was attacked with cholera; her slops and filth were emptied down the rain-water pipe, which communicated with the water butt below. The other people in the house drank of this water, and five out of nine died of cholera."—*Medical Times and Gazette, Sept.* 11, 1866.

The tenacity with which water retains "cholera stuff" has been established by Dr. Falkland. He has shown that it passes readily through filtering paper, and that water containing one-five-hundredth part of it, is not entirely purified by transmission through animal charcoal.

4.—CONVEYANCE OF CHOLERA FROM INDIA TO EUROPE AND AMERICA IN 1865 AND 1866.

From Ranking's Abstract of Medical Sciences, Vol. 44, p. 206, we learn that: "At the beginning of 1865 cholera was epidemic in the Bombay Presidency, and during that year the city of Bombay (although it has not been free from the disease for a single month for the last twenty years) suffered from a severer outbreak than had been experienced since the great

cholera year, 1850." From page 289 (*ibid.*), and also from *London Lancet*, Jan. 19, 1867, we learn that cholera first appeared in the Red Sea in 1865, on board two English ships, the Persia and North-Wind, carrying Eastern or Asiatic pilgrims from Singapore to Jeddah and Mecca. The captains both stated that the passengers and crews caught the disease at Mokulla, on the Arabian coast, where both vessels touched, and that it raged severely among them until they were opposite Leet, about one hundred miles below Jeddah.

As Mokulla trades largely, and perhaps chiefly, with Bombay, the disease may have been brought over from that city both in 1864 and 1865. Still, it is well known that cholera also prevailed in Java and Singapore in 1864 and 1865, and that convalescents from the disease were embarked on board pilgrim ships for Mecca. It may also have been brought from Calcutta, as two native vessels from Bengal, and a third vessel from Singapore, had numerous deaths from diarrhœa (and cholera) among their pilgrim passengers on the voyage to Jeddah.

About May 2, 1865, the cholera broke out violently in Jeddah and Mecca; and on May 21st, the cholera again broke out on the ship Persia, which was now carrying Western or European pilgrims from Mecca to Suez. Both the captain and his wife were attacked.

The *London Medical Times and Gazette* states that cholera reached Alexandria from Suez as early as May 11. By June 2, cases were frequent, and on the 11th there were thirty deaths per day, and on the 17th as many as sixty-one; yet the disease was not officially recognized till June 11, and foul bills of health were only issued to vessels from Alexandria on the 14th of June. Thus the disease was allowed to slip

out into the Mediterranean, and the cholera poison was widely disseminated, and had formed lodgments in Constantinople, Ancona, Malta, Marseilles, and Gibraltar, before the Egyptian sanitary authorities had taken any steps to stop its march.

On page 214 of Ranking's Abstract, Vol. 44, we find a report of the cholera epidemic of 1865, in the Maltese Islands, taken from the Official Medical Reports of the English Army Medical Department, Vol. 6, 1866 (Blue-Book). Army-Surgeons Adams and Welch state: "Towards the end of *May*, and before there was any knowledge of cholera having appeared at Alexandria, numerous pilgrims returning from Mecca had landed at Malta, *without* the imposition of quarantine. About the same time (May), the alarm beginning to spread in Egypt of cholera appearing in the track of the returning pilgrims, many Maltese returned home from Alexandria (without going to Mecca?). A quarantine was not established in Malta against Alexandria until June 14th. But Drs. Adams and Welch, from an attentive consideration of all the facts, are of opinion that Malta was infected by the choleraic poison prior to the commencement of quarantine, and that the poison came first to Malta in the track of the pilgrims and earlier fugitives."

"The facts relating to the appearance of cholera in the island of Gozo (a Maltese island) are very precise. A sailor, who had been serving on board a small vessel in the harbor of Valetta (Malta), returned to his home on the island of Gozo, with all the symptoms of cholera, on July 21st. He was nursed by his two sisters and two other women. All these were attacked on the 24th, and on the 25th another female attendant succumbed. From this last-named date, and *from*

these cases, the disease spread among the population of the island."

On page 208, we find that cholera was not officially recognized at Marseilles till July 23, 1865, although it must have arrived there early in June. From the *London Lancet*, January 12, 1867, we learn that: "From papers laid before the French Academy by M. Grimaud de Caux, it seems proven beyond all question, that cholera was introduced into France and first appeared in Marseilles subsequently to the arrival of a vessel with pilgrims from Alexandria. It has been asserted that cholera was present in Marseilles previously; but the supposed cases have been most satisfactorily explained away. Thus, much evidence was brought forward in proof of the contagion theory. Grimaud's reply, in full, will be found in the Comptes Rendus, Vol. 73, No. 16."

Marseilles was a great centre for the distribution of cholera in 1865. It was quickly conveyed to Paris, for as many as 16 deaths from cholera occurred in Paris in June; 30 in July; 125 in August; 200 in September; 4,466 in October; 1,218 in November; and 768 in December, 1865.

In October, when there were 144 deaths daily in Paris, the disease was conveyed to Havre, and carried by the passengers of the steamship Atalanta to New York by November 3d. A patient from the Atalanta introduced the disease into Ward's Island Emigrant Hospital, where on and after November 22 there were twenty-seven fatal cases.

From Marseilles the disease was also carried to Toulon. Mr. Calvy says three deaths occurred in a house in a healthy and isolated locality near Toulon, which was free from cholera at the time. A member of this family had attended upon persons who died of cholera in Marseilles.

From Marseilles it was also conveyed to Algiers by pilgrims from Mecca by September 24th. Also to Guadaloupe by a Marseilles ship by October 20th, and 10,806 died in this island out of a population of 149,107.

Cholera reached Odessa by August 6th, and was carried to Altenburg, in the heart of Saxony, in the manner described on page 52 of this treatise, and thus introduced into the Prussian armies, in which it committed great ravages.

CHOLERA IN SOUTHAMPTON.

On page 209 of Ranking's Abstract, Vol. 44, we learn that Southampton is the English port which maintains the closest and most rapid intercourse with Alexandria, and that it was only (p. 208) in this one port in all England that vessels arrived, in 1865, having had cholera on board shortly before, and in reality having the disease in active operation when they entered the harbor. In this same town occurred, shortly after, the first cases of cholera in England in 1865, viz., sixty cases, with thirty-five deaths. The extension of cholera from Southampton to Epping is noticed on page 51 of this treatise.

This was the first time that cholera reached England by the way of the South, but the disease did not commence to prevail till September, although suspicious vessels arrived in July, and cases of sickness attended with choleraic symptoms occurred in Southampton long before the disease was officially recognized.

Precisely similar events occurred in 1866.

In the *London Medical Times*, July 28, 1866, we read: "Up to June 10, 1866, Southampton had enjoyed a singular immunity

from disease of every kind, and diarrhœa was unknown in the place. On that day the steamship Poona arrived, having lost a man from cholera on the previous day. On the 11th, 12th, and 13th, several cases of diarrhœa occurred among the crew. On the 13th, a child of one of these men died in five hours with cholera, having slept in the same berth with its father, who was sick with severe vomiting and purging; the father died two days after. Then up to July 24th there were one hundred and twenty cases of cholera in Southampton, with sixty-six deaths."

The *London Medical Gazette and Times*, August 4, 1866, says:

"The first decided case of contagious cholera in Liverpool, unconnected with the Helvetia, was that of Mrs. Boyle, in a wretched close court in Bispham street, and the infection was spread in the neighborhood by the orgies of an Irish wake. Seventy-three cases were traced to this one cause."

Dr. Houghton says, in *London Medical Times and Gazette*, February 16, 1867:

"As a matter of fact, the first case of Asiatic cholera in Dublin, in 1866, appeared in the person of a woman named Magee, who imported the disease from Liverpool, on July 26, and carried it with her to the house No. 22 City Quay, where she died, having previously given the disease to a little girl, Mary Anne Mezler, who also died in a short time. The child's father, Andrew Mezler, next died, July 31; his widow sickened August 2d. The cholera thus introduced by Ellen Magee spread rapidly over Dublin, and killed one thousand one hundred and ninety-three persons."

"The disease contracted by Ellen Magee in Liverpool and thence imported into Dublin was in its turn originally im-

ported by the ship Helvetia into Liverpool, by German and Dutch emigrants, and Dr. Houghton has no doubt, if we possessed the requisite knowledge, the disease could be traced backwards in lineal descent to its origin in some poor Hindoo on the banks of the Ganges, as certainly as the pedigree of a horse or dog of repute can be traced to his remote ancestors."

I think I have almost succeeded in doing this.

Dr. Houghton thinks that, as long as we possess such a history of the introduction of Asiatic cholera, we are justified in rejecting other possible modes of its causation.

The *London Medical Times and Gazette* of Sept. 1, 1866, says: "The spread of cholera from the eastern to other districts of London has taken place so deliberately as to have made it an easy matter to investigate carefully into the history of isolated outbreaks, and a good deal of evidence of the transportation of the disease from infected to non-infected places and houses has been collected, and striking instances of infection are reported."

The *London Lancet*, Feb. 23, 1867, says about the recent outbreak of cholera in Jersey: "The disease is stated to be prevailing in Brittany, near St. Brieux, a port with which Jersey has communication. A French woman died Feb. 6, 1867, and her husband next day. An Irishman who waited on them formed the communication between this house and another, about one-quarter mile off, in which he and another died. A wake was held on these two persons, and ten of the company have since died. One hundred and two cases and thirty-nine deaths have already occurred. All the first cases died quickly, with diarrhœa, vomiting, cramps, and pulselessness. Later, the cases began by choleraic diarrhœa, running

or not into collapse. This is the fourth visitation of cholera in Jersey, viz., in 1832, 1849, 1854, and 1867. There had been no previous prevalence of diarrhœa—the disease dropped on the island without warning."

The history of the introduction of cholera in the County Hospital of Chicago in 1866, as reported by Dr. T. Bevan, is very instructive.

Up to August 6th, no apparent tendency to intestinal troubles beyond an occasional dysentery of some returned soldier with chronic diarrhœa had occurred in the hospital, when a Mormon train abandoned a man named Christian Hansen at the railroad depot; he was taken to the hospital, and died in five hours of cholera. The second and third cases occurred in a nurse and a patient on the 9th; the fourth occupied a bed next No. 1, and sickened on the 10th; the fifth on the 11th; the sixth on the 12th; the seventh, eighth, ninth, tenth, and eleventh cases occurred on the 13th of August; the twelfth, thirteenth, fourteenth, fifteenth, and sixteenth cases on the 14th; the seventeenth and eighteenth cases on the 16th, and the nineteenth and last case on the 17th of August. In addition, the warden of the hospital and the resident physician had distinctly marked choleraic attacks, but recovered. The epidemic lasted fourteen days, and was stayed by isolation of the patients, disinfection of discharges, cleanliness, and free ventilation. Fifty per cent. of the paupers died, and only twenty per cent. of the better class of patients, although the cases among the latter were more violent than among the former; the latter would react and convalesce, while the paupers quickly succumbed.

If the hospitals on Blackwell's Island had been as small, and the inmates as little numerous, the introduction of cholera

into them would not have been as mysterious as it now seems to be. The same holds good of the Brooklyn Penitentiary. (See pages 94 and 106 of this treatise.)

5.—PREVENTION OF CHOLERA.

In consequence of the sanitary measures described on page 22 of this treatise three, if not four, festivals at Conjeiveram have passed without an explosion of cholera.

In the Bombay Presidency there are 94 shrines to which pilgrimages are made. In the past year (1866), for the first time, these shrines and the devotees were subjected to sanitary control. The result has been remarkable, for cholera appeared at two only. This renders it probable if this important duty had been commenced in 1865, as at Conjeiveram, the disease would not have been conveyed from Bombay to Mokulla, and the epidemics of 1865 and 1866 would have been prevented from reaching Europe.

At Mecca the same sort of scavengering, burial of excreta and all organic refuse, was only commenced in 1866, but now will always be carried out. The great importance of this at Mecca is evident from Burton's account. He says: "At the feast of sacrifices the surface of the valley soon came to resemble the dirtiest of slaughter-houses, and in a few days, literally, the land stank. In addition the heat of Mecca is so great that clothing is unendurable during the middle of the day, for the city is so compacted together by hills that even the Simoom can scarcely sweep it. The heat, reverberated by the bare rocks, is intense and occasions great lassitude of body and mind."

The strictest quarantine and the most rigid and sanitary

regulations are necessary at Alexandria, Marseilles, Southampton, and New York.

As regards the disinfection of cholera discharges Pettenkofer's directions are the best. He says:

"The dejections of cholera patients, in their recent state, are generally either neutral or feebly alkaline. But after a lapse of a short time they become *decidedly alkaline*, and means should be taken to render and retain both the urine and fæces acid, and thus prevent alkaline or ammoniacal decomposition. This is easily done, for some metallic salts, mineral acids, and carbolic acid will preserve the urine and fæces in an acid condition for months. *Sulphate of iron* is the best on account of its efficiency, cheapness, and ready accessibility. For the disinfection of cesspools and out-door privies where urinary and fæcal discharges have accumulated in large quantities, and have already undergone alkaline or ammoniacal decomposition, the sulphate of iron or copperas must be added, in a concentrated solution, until the odor of ammonia and of sulphuretted hydrogen is completely removed, and the contents of the pit have an acid reaction after stirring. Then we may rest assured that ammoniacal decomposition will be delayed for months, although some other innocuous changes and some unpleasant fetor may arise. The offensive odor cannot all be removed by any known means, and can only be concealed by stronger penetrating odors; still, carbolic acid conceals the fetor of excrement completely, whilst its own smell, when diluted, is very bearable and even decidedly healthy. It also prevents ammoniacal decomposition. If one part of carbolic acid be dissolved in twenty parts of water, half a pint will be sufficient for the daily excreta of four persons, and will keep

them acid. About one ounce of copperas is required for the recent excrement of each person daily.

The disinfection of cholera-air has been discussed on pages 103 and 104. But some practical men think that cloths or towels soaked in a solution of permanganate of potash and waved about the sick-room is the best expedient. Still, Dr. Clemens prefers a spirit of chlorate of copper as a cholera-air disinfectant. Take of liq. cupri perchlorati concent. ℥ij.; chloroformi ℥j.; spir. vini ℥vj.; put some in a common glass spirit lamp. When the wick is lighted a vapor of chlorate of copper is formed, which in five minutes will pervade a chamber of 5,000 cubic feet so completely that all objects contained therein will be impregnated. In this way both the air and all other matters will be quickly disinfected, and that without danger, for it is claimed that even children do not suffer the slightest injury from this vapor.

The good effect of these preventive measures were abundantly proved in the experience of New York during the last epidemic. In New York city proper there were but 600 deaths from cholera last year, while in St. Louis there were no less than 3,527. Much credit is due to our efficient quarantine health officers; for in 1832 only 23 cases of cholera were received into the quarantine hospital, yet there were 3,572 deaths in the city; in 1849 there were 230 cases in quarantine, and 5,071 deaths in New York; in 1854, 415 cases at quarantine, and 2,509 deaths in the city; in 1866, 608 cases in the lower bay, and only 1,210 deaths in New York, Brooklyn, and in the numerous islands occupied by the extensive charitable, penal, and military establishments.

Of European towns the city of Bristol, England, has given the strongest testimony of the value of prevention and disin-

fection. Bristol is the home of Dr. Budd, who first suggested these procedures. In 1866 cholera was imported over thirty times into Bristol, and was directly traced to infection from other places in which it prevailed epidemically. There were only two instances in which a second case occurred in the same house after it came under the control of the sanitary authorities.

The results in London were also very striking :

From the 7th to 14th of July, 1866, there were 32 deaths in London; in the next week 346. From the 21st to 28th July, there were 904 deaths; in the following week 1,053 deaths occurred from cholera. The mortality had now attained a height that was not reached till two weeks later in 1849, and four weeks later in 1854, and cholera might well have proven a more terrible destroyer than it had ever yet been. But sanitary science fought against it as it had never fought before. In every parish the health officers were supported much better than in former epidemics; house to house visitation was energetically and efficiently carried out; cholera patients were removed to special hospitals; disinfection of all drains and sewers and of infected houses, bedding, and clothing was rigorously insisted upon; the still healthy were removed from infected houses, the water supply was looked to, and private charity came nobly forward. In the very next week the deaths from cholera fell from 1,053 to 781, and by the first week of September, which was the most fatal week in the two previous epidemics, the deaths were only 132. In 1849, 14,137 died in London; in 1854, 10,738; in 1866, only 5,548, of which 3,909 occurred in the Eastern district, and only 1,639 in all the rest of London.

The East London Company's water supply caused the increased deaths in East London, viz., from thirty-two to forty fold greater than either in the West, Central, North or South of London, and afforded another instance of the cholera-conveying power of water, and again proved that water is one of the greatest agents in diffusing cholera.

6.—PATHOLOGY.

It has been said that no disease presents more uniformity in respect to its morbid anatomy than cholera. But, unfortunately, the secondary phenomena, viz., those of congestion, are so much more prominent, that the real disease, that of the intestinal villi, has generally been overlooked.

The small intestines are generally well filled with a considerable quantity of pale, nearly colorless gruel, or rice, or cream-like matter, which Beale and others have proven to consist almost entirely of columnar epithelium, which has been stripped from the villi, so that all, or nearly all of them are left bare. The surface of the intestine is converted into a raw surface, comparable to that produced by an extensive and severe scald or burn, and the villi are so damaged that they can no longer act as organs of absorption.

Lionel Beale says it is probable that in bad cases almost every villus, from the pylorus to the ileo-cæcal valve, has been stripped of its epithelial coating during life. These important organs, the villi, are, in very bad cases, all or nearly all left bare, and a very essential part of what constitutes *the absorbing apparatus is completely destroyed.*

It is probable that the extent of this process of denudation determines the severity or mildness of an attack of

cholera. If the great majority of the villi have been stripped, it is scarcely reasonable to consider recovery more probable than it would be after a very extensive burn or scald.

Dr. Bartholow, of Cincinnati, says it is obvious that this destruction of the columnar epithelium not only arrests the vital power of selection and absorption naturally possessed by the villi, but produces an outward diffusive current of serum from the intestinal capillaries, followed by an extraordinary amount of congestion of the veins of the bowels.

Beale says the capillaries are distended to three or four times their ordinary diameter, so that the smallest vessels are injected very easily, and a very rapid transudation of fluid through the capillary walls can easily be made to take place after death.

The glandular apparatus of the small and large intestines becomes the seat of equally striking changes. The solitary glands enlarge, become filled with a milky fluid. The plates of Peyer become prominent, and the mesenteric glands also enlarge somewhat.

Not only is a great outpouring of serum from the intestinal capillaries thus induced, but the digestive process is arrested; no fæces are formed, although bile is still produced, and may be present at times in the discharges.

The arrest of primary assimilation, and the rapid loss of serum, soon occasion serious changes in the blood. It becomes viscid and dark. The red globules in the portal vein are irregular in outline, and broken up; the serum is crowded with debris and granular matter. The blood globules in the capillaries, small veins of the villi, and submucous tissue of the bowels, appear to have been in a great measure destroyed, and in their place are seen clots contain-

ing blood-coloring matter, minute granules, and small masses of germinal matter evidently undergoing active multiplication.

Similar appearances are found in the air-tubes, for Mr. Besnier has found throughout the entire extent of the bronchial mucous membrane a deposit of reddish viscous matter, forming a kind of jelly on the surface. The quantity is variable, but it often formed a layer sufficiently thick to block markedly the bronchial tubes. It was detached with difficulty by a very strong current of water, and was more abundant in the smaller bronchial tubes. The deposit was evidently formed of the epithelial cells of the bronchial mucous membrane, which, though rare in the normal state, become very abundant and voluminous in cholera.

Below the epithelial deposit, the bronchial mucous membrane presented an intense uniform redness.

When the cholera asphyxia occurred rapidly, there was congestion of the inferior lobes of the lungs; but when it was slow and progressive, the pulmonary congestion was slight, but the epithelial deposit abundant and accompanied by an emphysematous condition of the lungs more marked and extensive than in the rapid cases. Besnier contends that the asphyxia of cholera arises from the obstacle opposed by this epithelial deposit to the entry of air into the air cells, and not solely to mere thickening of the blood, or to non-penetration of blood into the pulmonary capillaries.

Bartholow, of Cincinnati, found the pleura, sac of pericardium and peritonæum, coated with a gummy substance which adhered tenaciously to the hands, and so glued the pulmonary and costal pleura together, as to require, in some instances, no inconsiderable force to separate them, and which must have increased the difficulty of respiration. This sub-

stance was found to consist of cast-off epithelium, and of the lubricating serum deprived of much of its water.

7.—TREATMENT OF CHOLERA.

Internal disinfection is the most important part of the treatment of cholera. This may be readily and pleasantly done by using a small quantity of *permanganate of potash* in water as a common drink. *Carbolic acid* has been used, very dilute, as a drink, and in starch injections, in five slight and seven severe cases, with only three deaths. I have seen cases recover under the use of sulphate of iron, and think that the directions on page 110, prescription No. 32, on page 115, and Nos. 1, 2, 3, 4, 5, 14, 26, and 27, on pages 116, 117, and 119, are well worth attention and trial. Injections of a strong hot solution of sulphate of iron will doubtless be found more useful than those of green tea, but they will almost indelibly stain the clothing.

The next indications of treatment are to prevent the destruction of the columnar epithelium, arrest the outward diffusion current through the intestinal canal, and obviate the retention in the blood of the effete and poisonous substances which should be eliminated by the kidneys.

Beale truly says: The removal of the columnar epithelium from the villi, and the consequent destruction of the mechanism of absorption, are broad facts in cholera which deserve our first attention. We must well consider how this denudation may be prevented, lessened, or retarded; and when it has taken place, what medicines or substances should be brought in contact with the raw and naked intestinal mucous membrane, to soothe or heal it. In preference to using any

harsh measures, Beale thinks it better to let the denuded villi remain perfectly quiet in the hope that the damage may be repaired by nature.

Guided by these suggestions, Dr. Clarke, of the London Hospital, treated fifty-six cases with colored sweetened water, with twenty-eight deaths. On board the hospital ship Belle-isle, near London, twenty-eight slight and nine severe cases were treated with nothing, with only one death. Flaxseed tea, white of eggs, mucilage of gum-arabic, glycerine, and sweet oil and lime water, have been suggested for the simple treatment of cholera.

Dr. Bartholow, of Cincinnati, found all the discharges in cholera to have an *alkaline* reaction, and to consist of a serous fluid, almost identical with the serum of the blood, merely mixed with columnar epithelium and debris. The perspiration was feebly alkaline or neutral. The urine rapidly diminished in acidity, and finally became alkaline. Hence it has been inferred that *acids* should form a principal part of the treatment of cholera. Prescriptions No. 22, page 114; No. 6, page 117; and Nos. 23 and 24, p. 119, deserve trial in cases which resist the internal disinfectant treatment. *Sulphuric acid* stops diarrhœa and relieves pain. It is suited to atonic and pale serous diarrhœa in every stage, and often acts like a charm.

Its action in cholera is explained thus: The contents of healthy bowels are naturally acid; but in true choleraic diarrhœa the alkaline serum of the blood is poured out so copiously into the intestines as to render their contents no longer acid. Acids not only restore the natural acidity of the bowels, but cause the endosmatic current, which is always

towards the alkaline side, to return to its proper course, and thus reëstablish the function of absorption.

I prefer diluted phosphoric acid, either plain or given in gum-water, orgeat, or in syrup of gum arabic, and flavored or not with syrup of lemons or raspberries. There is, at least, no danger of injury to the teeth, as there always is when using the other mineral acids.

When the vomiting is excessive, one-grain doses of oxalate of cerium have been found useful.

The urine is very scanty in the first and second stages of cholera, and suppressed in all cases of collapse, so that a direct ratio exists between the severity of the case and the amount of the urinary secretion. Albumen, epithelium, and tube casts appear early in the urine, and increase rapidly in quantity. These appearances are manifest in the very inception of the diarrhœal stage, and are of great importance, both in a diagnostic and therapeutical point of view. Hence, at one stage of cholera, the treatment is resolved into that of Bright's disease, and bromide of potash is the best remedy.

Dr. Bigbie, physician to the Queen in Scotland, has also used bromide of potash with some success, especially against the cramps, in thirty-grain doses, every half or one hour, till one and a half or two ounces were taken. He says it will arrest the cramps and restlessness as few other remedies can; relieves capillary obstruction, brings on reaction, and speedy return of secretion of urine. It is a perfectly safe remedy.

In the later stages of the disease, when the system has sunk into a complete torpor, more active diuretics have been used with success. (See page 151, and prescriptions Nos. 10, 11, 12, and 13, page 117.)

Dr. Bevan, of Chicago, deserves great credit for the bold

but careful use of hypodermic injections of morphine and atropine, which he instituted. Of the former he used from one-sixth to one-fourth, and even one-third grain per time. It often moderated the cramps immediately, and lessened the vomiting and diarrhœa. In terrific cramps, one-third grain injections of morphine and inhalations of chloroform were found useless, but when one-thirtieth of a grain of atropine was added, relief ensued in half an hour, and lasted for nearly twenty hours. Then injections of one-fiftieth of a grain of atropine, with one-quarter grain of morphine, produced comfortable sleep, and ultimate recovery.

As simple non-absorption of water is said to produce all the symptoms of collapse, the directions on page 122 should be followed.

Artificial serum, composed of water, white of eggs, and table salt, has been largely used as a common drink to replace the immense quantity of blood-serum which is lost in the cholera discharges. Dr. Clark, of the London Hospital, has suggested a more complex and scientific artificial serum, viz.: Carbonate of soda, twelve grains; phosphate of soda, one grain; phosphate of lime, one grain; phosphate of magnesia, one-half grain; water, eight ounces. This mixture was supplied to his patients in large bottles, with pieces of lemon floating in it. They liked it, and drank it freely, as a common drink, and only six cases out of eighteen died.

Richardson thinks that the food and drink may also be made the means of introducing heat abundantly into the interior of the system, in the algid stage of cholera. Dissolve with gentle heat, two ounces each of stearine and best fresh butter; beat up well eight ounces of whites and yolks of eggs with twenty grains of carbonate of soda, and eighty grains

of best fine table salt. Then mix the whole together at a temperature not above one hundred and forty degrees.

Let the whole cool to a soft consistency; then spread it on a board or slab and rub in two ounces of water with a broad spatula. Place the whole in a broad-mouthed jar.

For use in cholera, put one table-spoonful of this mass in a large breakfast cup and rub it up equally with a tea-spoonful of glycerine, or water, or fine sugar and water, or honey and water; then pour on three ounces of actually boiling water, and mix well. This mixture will cool at once, and the thermometer will only register one hundred and thirty degrees to one hundred and thirty-five degrees of heat; proving that forty-four degrees have been rendered latent for every ounce of fluid. This will be given up to the tissues when it reaches them. A pint of this fluid will render up no less than two hundred and four degrees of heat.

It is agreeable to taste, and sets well on stomach. Opium, creosote, dilute sulphuric acid, or port wine and other medicines, have been given in it.

It is to be hoped that these complicated mixtures will prove more useful than the simpler ones directed on pages 122 to 125.

The simple treatment of collapse has been found the most efficacious. (See pages 124 and 125.)

In collapse, Dr. Carroll, of Cincinnati, says, all the blood which sustains life is confined to the brain, chest, and abdomen. After the patient has lost twelve or fifteen pounds of fluid, the remainder accumulates in the great centres of the body, and if you attempt to produce reaction too suddenly and diffuse this quantity, already too small, too quickly throughout the general system, the result will be disastrous.

The heart is already feeble and contracts on a small amount of blood, only sufficient to keep up its pulsation; the brain, too, has barely an adequate quantity to prevent fatal exhaustion; withdraw this little too quickly, and the patient will die suddenly.

Hence use light, instead of very heavy and warm coverings. Give one teaspoonful of brandy in two of water or gum-water, five or ten minutes. For if you suddenly produce excessive external heat, the heart and nervous system are left so deserted that they will fail rapidly. Free ventilation should be secured; the windows should all be open; nothing should be said or done to discourage the patient; moderate friction only should be used; no heating substances should be applied externally for six or ten hours after collapse has been ushered in; then apply gentle heat only, by means of hot water in bottles, hot sand-bags for the purpose of gradually increasing the temperature of the extremities. In cool weather have fire in the room, but leave the windows open. Of twenty-nine cases of collapse, thus treated, nineteen rallied into the stage of reaction; and of these nineteen, twelve recovered.

Warm baths at ninety-eight to one hundred and four degrees were used in one hundred and thirty of Clarke's worst cases. The cramps ceased, anxiety of mind vanished, the pulse rallied, pain was relieved, and in some a tranquil slumber ensued. But the improvement was permanent in but few cases, and only transient in many. (See page 133.)

Richardson thinks that in collapse the homogeneousness of the blood can only be restored by direct injection into the veins of a proper fluid. To make this, dissolve one drachm of table-salt and one scruple of carb. soda in five ounces of water; whip up four ounces of white of eggs well and add

them to the water; heat the mixture in a water bath to one hundred and thirty degrees; stir steadily, digest for one hour, and remove from the fire. This forms a perfect artificial serum, the albumen of which hydrates freely.

Next melt one ounce of clarified animal fat and two ounces of pure glycerine in a crucible and pour it into the artificial serum at a temperature of one hundred and twenty degrees, and stir in carefully; let it cool to eighty degrees, skim off the floating fat and filter the remainder through coarse paper or close cloth.

The fluid thus obtained is of a pinkish color, alkaline reaction, saline sweetish taste, of specific gravity of 1.038; it picks up semi-fluid blood with instant readiness and diffuses it most equally. Two pints may be injected at one time at a temperature of one hundred and six degrees, when it will take up one-third more heat than water, and on cooling restore one-third more. A small quantity of alcohol increases the efficiency of these injections.

A more simple fluid for injection into the veins is: distilled water, twenty ounces; chloride of sodium, ʒi; carb. soda, twenty grains; chlorate of potash, six grains; phosphate of soda, three grains; pure alcohol, two drachms. Of fifteen cases, eleven died without the addition of alcohol, and four recovered with it.

7.—HOMŒOPATHY AND CHOLERA.

It is well known that the hydragogue cathartics, like elaterium, croton oil, jalap, gamboge, etc., are the truly homœopathic remedies for cholera. (See pages 140 and 165.) Yet, singularly enough, the homœopathists rarely or ever use them,

but rely upon infinitesimal doses of more or less antagonistic and allopathic remedies, like camphor, copper, arsenic, etc.

The homœopathic treatment is generally commenced with camphor, which has been used from time immemorial against diarrhœa, ordinary cholera, etc. Leadam says that it was even used by Serapius, who translated Dioscorides into Syriac. But Hahnemann doubtless got the idea from much later sources, for he tells us in his Lesser writings (page 753) that "a receipt has been given to the world which has proved so efficacious against Asiatic cholera, that of ten patients but one died. The chief ingredient is camphor, which is in ten times the proportion of the other ingredients." It is scarcely necessary to add that camphor has little or no homœopathic relation to cholera—certainly not as much as elaterium. Hahnemann and all his followers, also, instinctively avoid the use of infinitesimal or homœopathic doses of camphor, and the former directs strong spirits of camphor to be given at least every five minutes; also to rub some on the neck, head, arms, chest, abdomen, legs, etc.; also a clyster with two teaspoonfuls of spirits of camphor in one half pint of warm water; and, finally, that some camphor should be burned on a hot iron from time to time, so that the patient may inhale its vapors. This is very good treatment, but it is not homœopathic; on the contrary, camphor is an antidote to almost all homœopathic remedies and doses, which may be given subsequently. We have seen, on page 141, that veratrum, the remedy for the second stage, is not as successful as many homœopathists suppose, and it cannot well be in infinitesimal doses after the previous use of large doses of camphor, which antidotes it. The Hahnemannian remedy for the third stage, or that of cramps, when the patient is saturated, and his room and

clothes loaded with the vapors of camphor, is one or two globules of the thirtieth dilution of cuprum, or copper. This is an allopathic astringent, but cannot act as such in infinitesimal doses. Even the use of copper was not original with Hahnemann, for Dupuytren and others had used it previously (see page 145), and he tells us in his Lesser writings (page 755) that "trustworthy information from Hungary informs him that those who wore a plate of copper next the skin escaped the infection." We have shown, on pages 160 and 161, that few or none of the remedies in ordinary use by the homœopathists are homœopathic to cholera, as they do not use elaterium, etc., and it is almost safe to assume that they have never treated a case of cholera truly homœopathically. Hence, as they generally give infinitesimal doses of allopathic remedies, they must necessarily fail. They do not use their own remedies rightly, and a well-instructed regular physician can easily treat his cases, if he chooses, far more homœopathically than the oldest and most experienced homœopathist.

As it is not only easy, but natural to mistake various milder forms of disease for true Asiatic cholera, it is a matter of course that very many homœopathic physicians will rate their success very highly; others much more moderately. Thus two Cincinnati physicians say they treated one thousand one hundred and sixteen genuine cholera patients in 1849, with a loss of only thirty-five, or five and a half per cent.; Rubini, of Naples, five hundred and ninety-two cases (with allopathic doses of camphor), without a single death.

The *British Journal of Homœopathy* (vol. 15, p. 130) says: Dr. Stens makes the rather rash assertion that the homœopathic mortality in cholera is only eight and a half per cent. The British editors add: "Now, we should rejoice very much were

this the case; but, alas! we know from sad experience that it is at least three times as high as here stated. And this is a fact so easily ascertained by reference to the statistics of homœopathists themselves, that we (the British journalists) are surprised Dr. Stens has allowed such a flagrant exaggeration to damage the credibility of his other statements. We know very well the data on which the percentage of mortality he gives is founded, and we are well convinced of their utter untrustworthiness. How he could allow himself to put forward such an exaggeration, we are at loss to imagine."

The British journalists, of course, cannot believe Dr. Gerstel, who reported (see vol. 13, p. 329) to an Austrian Medical Society that he had treated three hundred cases of cholera, of a most inveterate character, with a loss of only thirty-two, or about ten per cent. An offer was made to Dr. Gerstel to practise under the control of the District Superintendent, Dr. Nushard, in order to establish proofs of the success of the homœopathic treatment, which he declined.

Dr. Rutherford Russell, one of the editors of the *British Journal of Homœopathy*, says, in vol. 7, p. 179:

"We cannot help deprecating the boastful tone we *so often* hear assumed by homœopathists on this subject—the treatment of cholera. It would argue a singular callousness of feeling in any one who has had much experience in the disease, at all events as it appeared among us, in Edinburgh, not to be penetrated with a profound sense of the comparative importance of our art in arresting, or even greatly modifying this terrible plague. In assuming what may be thought a tone of too great despondency as to the results of homœopathic treatment, we (Dr. Russell) refer to the fully developed disease. In its first stage, if we are permitted to see it

at this time, much may be done to prevent its further development, and we cannot speak too strongly of the value of camphor; but in the stage of collapse, I have never seen any evidence of camphor being of service."

In the *British Journal of Homœopathy*, vol. 9, p. 693, we read: "We paid a visit to Dr. Tessier's hospital. He has one hundred beds; the wards are airy and high, and the hospital is well situated and served. He informed us that he had never met anything but uniform kindness and respect from the Central Bureau of Hospitals, although at various periods there have been medical men among them, and such is the case at present; not the slightest opposition has been offered to him in the change (from allopathic to homœopathic practice) that he has carried out in the medical treatment of his patients." This we know refers to the Hospital St. Marguerite, in which Tessier admits a loss of forty-eight or forty-nine per cent. of his cholera cases. (See Hempel's and Radde's Tessier on Cholera, p. 107.) The loss was only thirty-five to thirty-nine per cent. at our quarantine last season; of six hundred and twenty-two cases of cholera and over fifteen hundred of diarrhœa, two hundred and forty-two died. Drs. Stens and Gerstel would doubtless have reported twenty-one hundred and twenty-two cases of cholera with about ten per cent. loss.

In vol. 12, p. 698, we learn that: "Dr. Tessier has been transferred from St. Marguerite to the Hospital Beaujon, one of the best regulated hospitals in Paris. His wards, male and female, contain one hundred beds. We are sorry to learn that the cholera has, in his wards, as well as in other hospitals in Paris, shown so malignant a type. One great cause for the increased mortality in all the hospitals, is the decidedly contagious character the disease has manifested. It thus spreads

from bed to bed and attacks patients already suffering from serious diseases." I infer that the loss was still greater than in the Hospital St. Marguerite, and believe that Tessier has never published any account of it.

In old times it might have been supposed and assumed that the contagiousness of the cholera in Tessier's wards accounted for the increased mortality. But we almost all believe in the contagiousness of cholera now, and cases occurring in a well-appointed hospital, come earlier under treatment than under many other circumstances. The drawback that they have been or are sick with other diseases is somewhat counterbalanced by the facts that they do not have to be transported a great distance, are not half starved or racked with the pangs of exhaustion and debauchery, as many other cholera patients are, and that physicians, trained nurses, medicines, food, and every aid and comfort, are on the spot, for instant service, by night or day.

Besides, this loss from contagion occurred in 1854, when Dr. Budd, of Bristol, had established the great principles of disinfection (see page 100 of this treatise). Tessier, who is certainly an honest, earnest, and scientific homœopathist, neither knew how to prevent the infection, nor control it after it had commenced.

Dr. Fleischman, of Vienna, has had the largest hospital experience of the homœopathic treatment of cholera (see *Brit. Jour. of Hom.*, vol 14, p. 27); viz., twelve hundred and two cases, with seven hundred and ninety-three recoveries and four hundred and nine deaths. I know, from personal observation, that Fleischman's hospital is perfect in all its appointments. It is almost exquisite in its neatness, cleanliness, order. The consolations of religion are extended by the Sisters

of Charity, and only the better class of the poor are admitted. The worst and most depraved classes find no entrance there. Yet Fleischman's results were only five per cent. better than on board the hospital-ship Falcon in our harbor last year. Fleischman candidly says: "In the treatment of this disease, at least, as we have it in a hospital, even for us homœopathists much remains to wish for. Every remedy which has been recommended has been tried and tried again by me, but I have little to say in praise of any of them."

Dr. Chargé, of Marseilles, received from the French Government the order of the Legion of Honor, and from Pope Pius IX. that of Gregory the Great, for services rendered in the cholera of 1849, in general practice. In the *British Journal of Homœopathy* (vol. 15, p. 173) we read: "In 1854 he was applied to by the Mayor of Marseilles to take charge of two cholera wards in the Hotel Dieu. All patients were to be sent on alternate days to the homœopathic and allopathic wards. It is true that Dr. Chargé resigned his trust after three reception days; it is also true that during those three days twenty-six patients were received and twenty-one died. Dr. Chargé complained that he had too few nurses allowed; that there was a great want of bed clothing, flannels, etc.; that patients in other wards, when they took the cholera, as they often did, were transferred to the cholera wards; and, as this process of transfer was entirely in the hands of the allopathic medical officers, an opportunity was thereby afforded them of retaining in their own wards patients attacked by cholera on the day of the allopathic admission until the following day, when they might be thrust, in a dying state, into the homœopathic wards; and this, Dr. Chargé asserts, was frequently done."

This I cannot believe, but think the explanation is, that in 1849 Dr. Chargé was dealing with diarrhœa, cholera morbus, and cholerine, in private practice, and hence seemed very successful; while in 1854 he for the first time came in contact with true cholera, as it appears in general hospitals. Dr. Chargé certainly is not as able nor as scientific a physician as Tessier, and his success, we have seen, was not great, without any such imaginary unfair play.

Finally, Dr. Drysdale, one of the editors of the *British Journal of Homœopathy*, gives us, in vol. 8, some data by which we can form a prognosis under homœopathic treatment. He treated one hundred and seventy-five cases, of which forty-three or more were mild, with forty-five deaths. About twenty cases seen in the first stage could not be saved. The cure of real choleraic, rice-water, painless diarrhœa, he says, was by no means an easy matter. Of those with severe cramps, twenty-two out of forty-six died; with coma, ten out of fourteen; with agonizing pain from the region of the heart, through the back, all, nine in number, died; with red purging, four, or all died; of the severe cases, without cramps, eight out of fourteen; with grinding of the teeth, four out of eight; with greenish tint of complexion, four, or all, died; when purging was followed by cramps before vomiting, six out of nine died; all, (only two) died which commenced with fainting. If the vomiting began before the purging, four out of eleven died; if the purging preceded the vomiting, only six out of twenty-six proved fatal; with delirium, only four out of eleven died; with vomiting in gushes, only four out of ten; with hiccup, only two out of twelve; with epigastric pain, six out of twenty-four; with abdominal pain, six out of thirty-

six; with moderate cramps, three out of nineteen; and all those which commenced with colic recovered.

In the *consecutive fever*, of nine with coma, six died; with delirium, only two out of eight; with slow pulse, four out of twelve; with quick pulse, two out of four; with suppressed urine, two out of five; with restlessness, six out of sixteen; with vomiting, three out of thirteen; with purging, six out of thirteen; with grinding of the teeth, three out of six; with sighing respiration, six out of ten; with sleeplessness, all, four in number, recovered; with headache, four out of six.

It is evident from all that has gone before, that many cases recover under all kinds of treatment, and under no treatment; and that many die under all varieties of treatment.

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