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REPORT

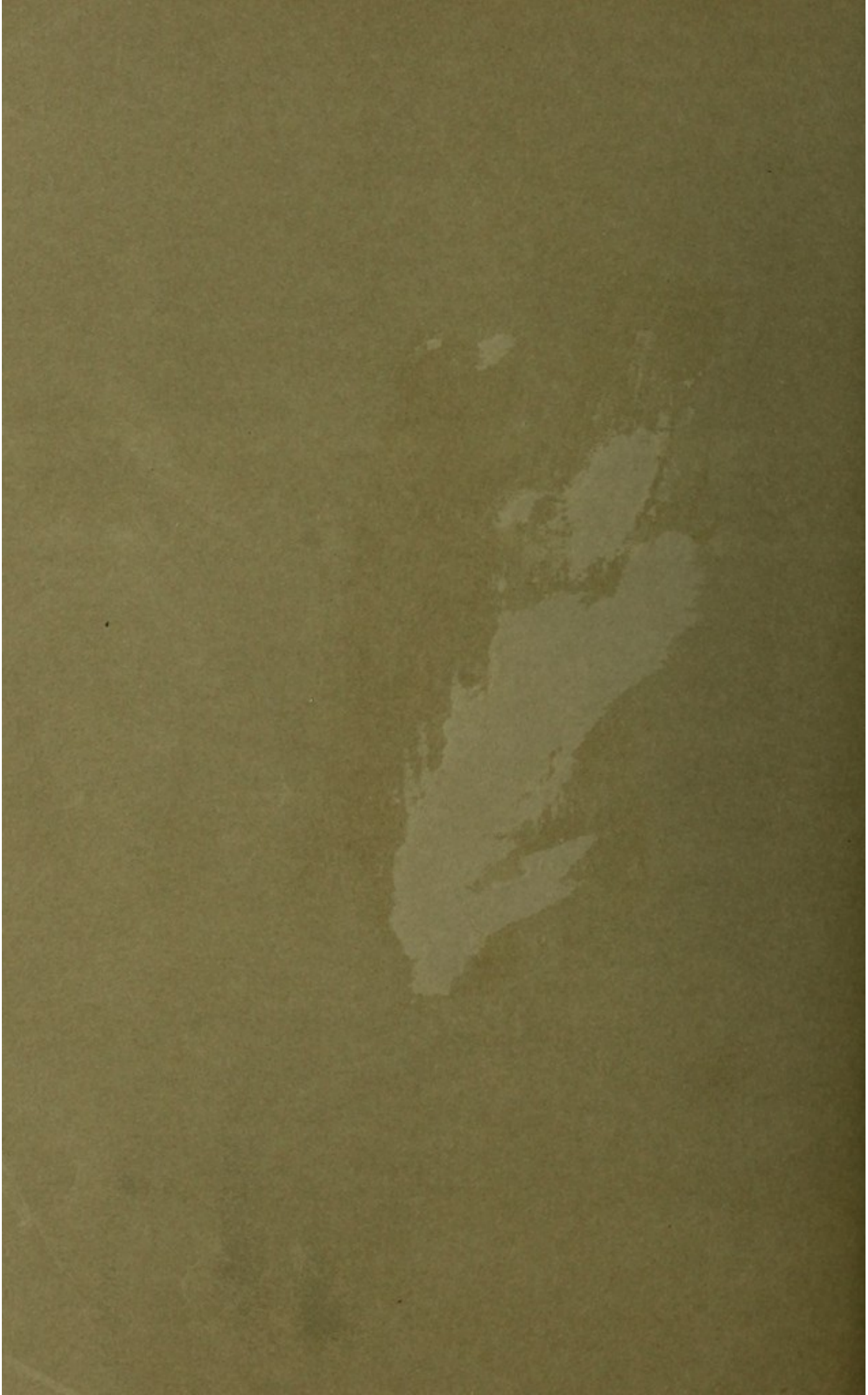
BY THE

MEDICAL OFFICER OF HEALTH

J. PARLANE KINLOCH, M.D.

FOR THE YEAR

1925



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CONTENTS.

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REPORT BY THE MEDICAL OFFICER OF HEALTH

For the Year 1925.

CHAPTER I.

SPECIAL INVESTIGATIONS UNDERTAKEN DURING THE YEARS 1925-26.

I—THE NEWER KNOWLEDGE OF DIPHTHERIA AND SCARLET FEVER AND ITS APPLICATION IN HOSPITAL PRACTICE AND IN COMMUNITY IMMUNISATION.

The following record of the investigation into the Newer Knowledge of Diphtheria and Scarlet Fever, which is the work of Smith, Taylor and myself, will be published in abridged form in an early issue of the *Journal of Hygiene*.

INTRODUCTION.

The newer knowledge of the bacteriology, immunology and serum-therapy of scarlet fever and diphtheria has warranted the following experimental investigation into the control of these diseases in Aberdeen during the past three years. The subject is developed under headings dealing in sequence with etiology, diagnosis, susceptibility tests, prevention by immunisation and antitoxic treatment.

The devising of an intradermal test of susceptibility to diphtheria by Schick (1908) and the use of toxin-antitoxin mixtures for the prevention of the disease as first suggested by Theobald Smith (1907), and as elaborated by Park (1913, 1915), Zingher (1915), and others, opened up a new field for research and provided a fresh prospect of adequately controlling diphtheria.

In the same manner the new light that has recently been thrown on the microbiology of scarlet fever has been a great advance. This fresh prospect of adequately controlling scarlet fever undoubtedly had its principal origin in the fundamental work of G. F. Dick and G. H. Dick (1923, 1924) wherein these workers demonstrated

that a particular variety of toxin-producing streptococcus apparently causes scarlet fever, that the symptoms of the disease are caused by the toxins of this organism, that the tissue cells of a convalescent patient provide a protective antitoxin, and that scarlet fever may be produced by experimental inoculation with hæmolytic streptococci and cured with antitoxic serum.

It is true that forty-three years ago Loeffler (1884) had directed attention to the hæmolytic streptococci which are invariably present in the throats of acutely ill scarlet fever patients, that Marmorek (1895) and Moser (1902) had produced scarlatinal antistreptococcic serums of some potency, that Savchenko (1905) had demonstrated that scarlatinal streptococci produce a potent exotoxin, that Gabritschewsky (1907) had actively immunised children with a scarlatinal streptococcus vaccine, and that Polotevkova (1921) had demonstrated the potency of Gabritschewsky's vaccine; but even with such results available, and in the absence of a measure of the streptococcus toxin such as was devised by the Dicks (1923), the current view of the vast majority of epidemiologists was the view set forth in current text-books such as the third edition of Kolmer, 1923, wherein it is stated "that the virus of scarlet fever is unknown, that those patients who are overwhelmed and prostrated at the very onset are probably intoxicated with the true scarlatinal virus, and that streptococci are probably the most important bacteria of secondary infection."

It has seemed well to emphasise this point since there has been a tendency to minimise the fundamental importance of the work of the Dicks as being merely a step in the ordered progress of the research into the disease. The work of the Dicks was undoubtedly merely a step in the progress of research, and was inspired by consideration of the work of Schick and his collaborators in regard to diphtheria; but a measure of toxicity, viz., the Dick test (Dick, 1924), was essential before the work of the earlier investigators could be corroborated and put on a scientific basis and the new immunising devices made generally available. At the same time it must frankly be admitted that the accumulated data relative to the value of active immunisation against diphtheria by means of a diphtheria toxin-antitoxin mixture enormously stimulated the work on scarlet fever and has provided the prospect of making available a combined diphtheria and scarlatina prophylactic which will be safe and efficient.

In the experimental investigation into the newer methods of actively and passively immunising against diphtheria and scarlet fever, as about to be recorded, the work has been carried out within the in-patient and out-patient departments of Aberdeen City Fever Hospital, within the schools of the Education Authority, and within the City generally.

Etiology of Scarlet Fever and Diphtheria.

Etiology of Scarlet Fever.—A complete historical review of the attempts to produce scarlet fever in human beings is given by Hektoen (1923). Experimental inoculation had been made with throat secretions, filtered and unfiltered, skin scales,

blood, and even cultures of organisms from scarlet fever cases. Hektoen concluded that no indubitable case of scarlet fever had occurred, and, moreover, accidental inoculation of human beings with material from scarlet fever patients had occurred in such a manner that no light was obtained on the etiology of the disease.

In 1923 and 1924, however, G. H. Dick and G. F. Dick published the results of their experimental work and by inoculation on man showed that scarlet fever is the result of infection with a hæmolytic streptococcus and that the exanthem is due to the absorption of a true exotoxin produced by this organism.

As regards scarlet fever, the studies reported in this paper have now been in progress for the past three years. The results which have been obtained in relation to the etiology, prevention and treatment of scarlet fever, and in relation to the prevention of diphtheria, are of considerable interest.

Streptococcus hæmolyticus in Scarlet Fever Cases.— The bacteriological investigation (J. Smith, 1926) has shown that hæmolytic streptococci can be obtained from the throats of practically all cases of scarlet fever during the initial stages of the disease. From 247 cases of scarlet fever on admission to hospital 209 strains of hæmolytic streptococci were obtained on culturing the tonsillar secretion, while another strain was obtained from the pus in a case of surgical scarlatina. Table I. shows the number of cases in relation to the presence of hæmolytic streptococci in the throat culture.

Table I.

Number of cases showing S. hæmolyticus in throat cultures.

Day of illness when admitted . .	1	2	3	4	5 and over.
Total number of cases . . .	69	82	47	24	34
Number positive	63	77	36	15	18
Number negative	6	5	11	9	16
Per cent. positive	91	93	76	62	52

A preliminary serological classification of these various strains has been accomplished by means of the agglutination and absorption tests. These reactions have shown that the strains of *S. hæmolyticus* can be divided into various groups. Type I. strains were obtained in 118 cases, Type II. strains from 57 cases, and the strains from 34 cases having remained unidentified. In addition, the pus from one case of surgical scarlet fever, from which no hæmolytic streptococci could be obtained from the throat culture, showed a Type I. strain. Different types have not so far been encountered in the throat cultures from cases at the commencement of the illness even though two strains were tested from each source.

From nasal swabs of 247 cases hæmolytic streptococci were obtained sixteen times. Ten cases showed Type I. streptococcus, 5 cases Type II., and in 1 case the strain was not classified.

In addition to the case of surgical scarlet fever, pus was obtained from 10 cases during the course of the disease, and the relationship of these strains to those obtained from the throat and nose of the same case is shown in Table II.

Table II.

Case No.	Septic Complication.	Serological Types Isolated. Throat.	Nose.	Pus.
1.	Mastoiditis	I.	0	II.
2.	,,	I.	0	I.
3.	,,	II.	0	II.
4.	Otitis	I.	0	I.
5.	,,	II.	II.	I.
6.	,,	II.	0	II.
7.	Adenitis	II.	0	II.
8.	Otitis	II.	0	II.
		+	+	+
9.	Adenitis	All strains unidentified.		
10.	,,	I.	0	I.

Two to three members of five families were admitted to hospital suffering from scarlet fever and the strains found in the throat cultures have shown agreement in their serological classification, except in one instance, where the second case occurred after the first had been discharged from hospital. Again, two localised outbreaks of scarlet fever in the wards of a hospital showed, in the first instance, 7 cases all harbouring Type I. strains and in the second outbreak 3 cases with Type II. streptococcus. Strains of streptococci have also been obtained from various individuals not suffering from scarlet fever, and, of these, four strains from cases of otitis, cervical abscesses, purulent rhinitis, and from a normal throat were found to belong to Type I. Type II. strains were obtained from 2 cases of tonsilitis and from the respiratory passages of 4 normal individuals in a scarlet fever infected ward.

In the development of this preliminary work on the classification of scarlatinal streptococci it has been found repeatedly that hæmolytic streptococci obtained from cases of tonsilitis fall into one or other of the serological groups of the scarlatinal streptococci, and that streptococci isolated from cases of puerperal fever, erysipelas, and broncho-pneumonia occasionally also fall within the scarlatinal serological groups. The detailed evidence relating to these findings will be submitted in a later contribution, and the findings are referred to here in order to throw light on the nature of the immunity induced by injections of scarlatinal streptococcus toxin and on the increased incidence of streptococcal tonsilitis that has been found to occur in nurses immunised against scarlet fever, to which reference is made in some detail in a later part of the text (see p. 17).

The more extensive investigation which will be published as a separate communication fully confirms Smith's earlier finding to the effect that the same type of streptococcus can on occasion originate at least five separate clinically distinguishable diseases, namely, scarlet fever, tonsilitis, erysipelas, puerperal fever, and broncho-pneumonia, and accordingly there emerges what amounts to a new epidemiological conception, and it is necessary to reorientate present knowledge of immunological processes to meet this fresh requirement. From this new viewpoint, therefore, it would appear that, so far as streptococcic infections are concerned, the

nature of the resulting disease entity is determined by the toxigenic qualities of the type of streptococcus, by the susceptibility or insusceptibility of the individual as determined by the absence or presence of the specific antibodies in the blood, and by the site of the infection itself.

In a critical review of the various steps undertaken in working out the etiology of scarlet fever, Dochez (1925), who has himself made contributions of the greatest importance to this subject, states that the chain of evidence in favour of the streptococcus is as strong as that in many diseases whose etiology is now accepted without discussion, and that there is little room to doubt that the *S. scarlatinæ* is the principal and probably only cause of scarlet fever.

Etiology of Diphtheria.—It is unnecessary to discuss the experimental work upon the virulence and typing of diphtheria bacilli which has been undertaken in recent years, since the work has been fully surveyed in the *Medical Research Council Monograph on Diphtheria* (1923).

Diagnosis of Scarlet Fever and Diphtheria.

Diagnosis of Scarlet Fever—Schultz-Charlton Reaction.—Schultz and Charlton (1918) considered the possibility of blanching the punctate erythematous rash of scarlet fever by the intradermal injection of convalescent serum. In the original Schultz-Charlton diagnostic test for scarlet fever, 1 c.c. of human serum from a convalescent scarlet fever patient was injected intracutaneously at the height of the eruption into an area where the rash was well marked, and if the rash was scarlatinal, a positive reaction was obtained, an anæmic zone appearing 5 to 8 hours later, varying in size from that of a five-shilling piece to that of the palm of the hand. With the production by the Dicks (1923) and by Dochez (1924) of potent scarlatinal antistreptococcic sera from horses, such sera were made available for the Schultz-Charlton test, and as now performed 0·2 c.c. of a 1 in 10 dilution of scarlatinal antistreptococcus horse serum is similarly injected intracutaneously into the brightest area of the rash, and if the test be positive an area of blanching about 30 mm., or 1 inch, in diameter appears usually in about four hours, and always within twenty-four hours at the site of injection. In the investigation here recorded, the Schultz-Charlton test as thus modified has been carried out among 135 patients who were in their clinical appearances undoubted cases of scarlet fever.

Table III.

Rash at its Height.				Rash commencing to Fade.		
Number Tested.	Number Positive.	Percentage Positive.		Number Tested.	Number Positive.	Percentage Positive.
51	47	92·1%	...	84	74	88·1%

Reference to Table III. shows that the Schultz-Charlton reaction was positive in 92·1 per cent. of 51 cases that were tested when the rash was at its highest stage of development, and in 88·1 per cent. of 84 cases tested when the rash was beginning to fade. It is not contended, however, that the degree of development of the rash alone determines a positive or negative result. On the contrary, the Schultz-Charlton reaction has on occasion been found negative in patients whose rash was fully developed and of a lobster-red appearance, and it has been assumed that the

negative nature of the reaction in the 10·4 per cent. of the cases here recorded is perhaps attributable to known differences in the strains of scarlatinal streptococci. Experience has satisfied us that, while the Schultz-Charlton reaction is of real assistance in the diagnosis of doubtful cases of scarlet fever, its value is greatly limited by the impossibility of obtaining a definite reading with rashes other than those that are at the height of their development.

The Dick test of susceptibility to scarlet fever is of some value in diagnosis, but the value is limited. Thus, as shown in Table IV (see p. 7), 86·3 per cent. of scarlet fever patients have been found to give a positive Dick reaction during the first two days of illness, after which the percentage of positive reactors steadily diminishes; but a Dick-positive reaction has its use as a confirmatory test in the presence of a positive Schultz-Charlton reaction. A Dick-positive reactor becomes negative within twenty-four hours of antistreptococcic serum administration.

Diagnosis of Diphtheria.—The clinical and bacteriological findings continue to determine the diagnosis of diphtheria, susceptibility tests being of the same limited value as the Dick test in the diagnosis of scarlet fever. A Schick-positive reactor becomes negative within twenty-four hours of diphtheria antitoxin administration.

Susceptibility Tests to Scarlet Fever and Diphtheria.

In submitting the results of the susceptibility tests to scarlet fever and diphtheria as obtained in this investigation, it has seemed well to give at the same time a brief description of the technique of the respective tests and of the method of interpreting the tests.

Dick Test of Susceptibility to Scarlet Fever.—Owing to the insusceptibility of laboratory animals to the toxin of *S. scarlatinæ*, it has not been found possible to use them for standardising this product as can be done in standardising diphtheria toxin. The use of the human skin test dose as a measure of the strength of scarlatinal streptococcus toxin is accordingly necessary. Our preliminary experiments with various dilutions of toxin indicated at an early stage of this investigation that the stronger the toxin the higher was the percentage of positive reactors. This difficulty of determining an exact standard of toxicity is a serious drawback, and is a great handicap to the bacteriologist and clinician alike.

In the Dick test as practised in Aberdeen City Hospital, 0·2 c.c. of a dilution of the soluble toxic filtrate obtained from a broth culture of the scarlatinal streptococcus is injected intracutaneously into the flexor aspect of the left forearm. At the same time a control test with diluted toxin which has been inactivated by being heated in a water bath at 100° C. for one hour is made on the flexor aspect of the right forearm. By examining the Dick test and the control it is possible to differentiate four distinctive reactions, viz., the positive, the negative, the negative-pseudo, and the positive combined.

(1) The positive Dick reaction develops in 6 to 12 hours as a light red flush, and it reaches its maximum in 24 hours, showing a circumscribed area of redness with slight infiltration measuring from 15 to 30 mm. in diameter. This

positive Dick reaction at the end of 24 hours closely resembles the positive Schick reaction which has reached its maximum intensity on the fourth day. The Dick reaction fades more rapidly, only the strong positive reactions showing a slight brownish pigmentation at the end of 7 to 10 days.

(2) The negative reaction shows no change at the site of the test or control.

(3) The negative-pseudo reaction shows the same appearance in the test and control. These reactions are due to a protein hypersensitiveness to the autolysed substance of the hæmolytic streptococcus, and to the other proteins in the test fluid.

(4) The positive combined reaction represents a combination of the positive and negative-pseudo reactions. The reaction in the test with the unheated toxin is more pronounced than in the control with heated toxin.

The positive and positive-combined reactors are susceptible to scarlet fever so far as not having sufficient antitoxin in their blood is concerned. The negative and negative-pseudo reactors have antitoxin in the blood and are presumed to be immune to the toxic effects of the scarlatinal streptococcus.

The results of a preliminary investigation (Smith and Taylor, 1926) of the value of the Dick test as a measure of susceptibility to scarlet fever have already been published and are in accord with those obtained by American workers. These preliminary tests are summarised in the following table:—

Table IV.

The Dick Test in Scarlet Fever Patients.

Day of Disease . . .	1-2	3	4	5	6	7-14
Total number tested . .	58	40	30	17	7	18
Number positive . .	50	28	18	9	3	5
Number negative . .	8	12	12	8	4	13
Per cent. positive . .	86·3	70	60	52·9	42·8	27·7

Thus of 170 cases of scarlet fever tested, 86·3 per cent. gave a positive Dick reaction in the first two days of the illness. The percentage of positive reactors rapidly decreased, and when 158 were retested during convalescence in the fourth week of the disease, only 14 per cent. were found to react positively. Of 267 normal individuals who gave no history of scarlet fever, and who were Dick-tested, it was found that in the age-period under 6 months only 20 per cent. gave a positive reaction; from 6 months to 5 years, 77 per cent. gave a positive reaction; in the 6-10 year period, 46 per cent.; in the 10-20 period, 38 per cent.; while in the group 20 years and upwards, 27 per cent. still gave a positive Dick reaction. In a series of 60 individuals who gave a definite history of having had scarlet fever, and who consisted for the most part of the nursing and domestic staff of the hospital, 9 individuals gave a positive Dick reaction.

This preliminary investigation having been completed, we proceeded to elaborate greatly the work, and with this end in view we determined the varying susceptibility of the patients in hospital, of children attending middle class and west-end schools, of children attending the various Child Welfare Centres, and of adults throughout the City generally.

Susceptibility to Scarlet Fever according to Age-period.—Table V. shows the results, in age-groups, of the Dick test carried out in 1,500 individuals of random distribution, the individuals being tested without regard to class, occupation, locality, size of dwelling, previous attack of the disease, or any other factor which apparently may have an influence on susceptibility.

Table V.

The Dick and Schick Test in 1,500 Individuals (Normal).

Age Groups.	Nos. Dick-Tested and Schick-Tested.	Percentage Dick + ve.	Percentage Schick + ve	Percentage Schick and Dick + ve.	Percentage Schick and Dick – ve.
0-5 years .	63	96·4	94·0	90·4	4·0
5-10 years .	602	81·2	80·0	67·2	5·2
10-15 years .	664	65·5	67·9	51·7	13·2
15-20 years .	119	60·8	64·5	47·4	13·9
20-25 years .	44	52·4	54·2	35·6	26·9
25 years and over .	8	27·2	27·2	18·1	19·1
Total Nos. .	1,500*	72·1	73·0	58·6	10·9

* Including 121 persons who had formerly suffered from scarlet fever and of whom 13, or 10·7 per cent., proved Dick-positive. The figure also includes 105 persons who had previously suffered from diphtheria, and of whom 43, or 41·0 per cent , were Schick-positive.

Reference to the table shows that in the age-period 0-5 years, 96·4 per cent. gave a positive Dick reaction; 5-10 years, 81·2 per cent. gave a positive reaction; 10-15 years, 65·5 per cent. were positive; 15-20 years, 60·8 per cent.; 20-25 years, 52·4 per cent.; and 25 years and over, 27·2 per cent.

Susceptibility to Scarlet Fever according to Sex.—Table VI. shows the results, in males and females respectively, according to age-period, of the Dick test carried out in the same 1,500 individuals.

Table VI.

Susceptibility in the Sexes.

0-5 years .	63	92·1	95·6	96·8	83·3
Age Groups.	Nos. Dick-Tested and Schick-Tested.	Percentage Females Dick + ve.	Percentage Males Dick + ve.	Percentage Females Schick + ve.	Percentage Males Schick + ve.
5-10 years .	602	79·6	83·4	80·6	81·5
10-15 years .	664	64·8	68·2	74·4	65·1
15-20 years .	119	73·1	47·4	88·5	68·4
20-25 years .	44	62·5	52·4	75·0	47·6
25 years and over	8	—	—	—	—
Total Nos. .	1,500	66·9	50·2	85·5	63·7

On referring to the above table, it is found that, in the 0·5 year age-period, 95·6 per cent. of males are Dick-positive as compared with 92·1 per cent. of the females; in the 5-10 year age-period, 83·4 per cent. males to 79·6 per cent. females;

in the 10-15 year age-period, 68·2 per cent. males to 64·8 per cent. females; in the 15-20 year age-period, 47·4 per cent. males to 73·1 per cent. females; and in the 20-25 year age-period, 52·4 per cent. males to 62·5 per cent. females.

Susceptibility to Scarlet Fever according to Social Condition.—Table VII. shows the results of susceptibility according to social condition. In this connection, 718 children from west-end schools have been tested, 392 children from middle class schools, and 404 children from east-end schools.

Table VII.

Susceptibility according to Social Conditions.

Dick Test.				Schick Test.		
Numbers Tested.	Number Dick + ve.	Percentage Dick + ve.		Numbers Tested.	Number Schick + ve.	Percentage Schick + ve.
West-End School Children.						
718	562	78·3	...	708	556	78·5
Middle Class School Children.						
392	231	59·0	...	376	235	62·5
East-End School Children.						
404	118	29·2	...	404	126	31·2

It is found that, of west-end school children, 562, or 78·3 per cent., were Dick-positive; of middle class school children, 231, or 59·0 per cent., were Dick-positive; while of east-end school children, 118, or 29·2 per cent., were Dick-positive.

Susceptibility to Scarlet Fever of Persons who gave a History of having formerly suffered from the Disease.—It next appeared desirable to ascertain the susceptibility to scarlet fever as determined by the Dick test of persons who had formerly suffered from scarlet fever. Reference to foot-note to Table V. (see p. 8) shows that of 121 persons who had formerly suffered from scarlet fever, 13 individuals, or 10·7 per cent., proved Dick-positive.

The Dick Susceptibility Test in Cross-infected Wards.—Further evidence of the value of the Dick test as a guide to the susceptibility of individuals has also been obtained by testing patients in wards in which cross infection with scarlet fever has taken place, or in wards to which cases of scarlet fever may have been accidentally admitted. In this way scarlet fever has been observed to occur in 21 patients who previously showed a positive Dick reaction. On the other hand, numerous cases (notified as scarlatina) were admitted to the scarlet fever wards with no definite clinical sign of the disease and when found to be Dick-negative were allowed to remain in contact with other scarlet fever cases. In no single instance was a case of scarlet fever found to follow. In 7 instances, cases were admitted in the third or fourth week of illness with a definite desquamation and appeared clinically to have

had a typical attack of scarlet fever. The Dick test in all 7 cases was markedly positive on admission, and all developed a second attack of the disease. In those cases in which the Dick test had been carried out during a period of two to three weeks prior to the attack of scarlet fever the area on the forearm corresponding to the previous reaction again became intensely red as compared with the rash on the surrounding skin.

Observation.—It has been observed that the intensity of the Dick reaction is of much significance, and in the present investigation scarlet fever has only been found to occur in individuals giving a marked Dick reaction. It is thus probable that numerous individuals regarded at present as susceptible will later be eliminated when further investigation has been made of the immunity mechanism in scarlet fever and when a method of more accurate standardisation of the toxin has been evolved. The future, however, will undoubtedly see the Dick test in relation to scarlet fever as firmly established as the Schick test is in relation to diphtheria.

Schick Test of Susceptibility to Diphtheria.—In the Schick test, which has been devised for testing susceptibility to diphtheria, 0·2 c.c. of a diluted diphtheria toxin representing 1-50th m.l.d. for a guinea-pig weighing 250 grm. is injected intracutaneously into the flexor aspect of the left forearm. Into the right forearm in a similar situation there is injected as a control the same amount of diluted toxin which has been inactivated by being heated in a water bath at 75° C. for ten minutes. The reaction is read after 48 hours, and finally recorded after five days. By examining the Schick test and the control, it is possible to differentiate four distinctive reactions, viz., the positive, the negative, the negative-pseudo, and the positive-combined.

(1) The positive Schick reaction shows a circumscribed area of redness and slight infiltration measuring from 15 to 30 mm. in diameter as appearing in from 24 to 48 hours. The reaction reaches its maximum intensity on the fourth day, and may persist for about a week. On fading, it leaves a brownish pigmentation and superficial scaling.

(2) The negative reaction shows no change at the site of the test or control.

(3) The negative-pseudo reaction shows the same appearance in the test and control. It appears appreciably earlier than the true reaction, being often at its best after 24 hours. It shows much less pigmentation, and never scales. These reactions are due to a hypersensitiveness to the proteins in the test fluid.

(4) The positive-combined reaction represents a combination of positive and negative-pseudo reactions. The reaction in the test and the unheated toxin is more pronounced than in the control with heated toxin.

The positive and positive-combined reactors are susceptible to diphtheria, so far as not having antitoxin in their blood is concerned. The negative and negative-pseudo reactors have antitoxin in the blood, and are immune to the toxin of diphtheria.

The results of the Schick test as here recorded are in the main in conformity with the results obtained in America and elsewhere.

Susceptibility to Diphtheria according to Age-Period.—Schick tests were performed in the 1,500 individuals, the results of whose Dick tests have been recorded above, and it has been seen that these individuals were tested without regard to class, occupation, locality, size of dwelling, previous attack of the disease, or any other factor which apparently may have an influence on susceptibility. Reference to Table V. on page 8 shows that in the age-period 0-5 years, 94·0 per cent. gave a positive Schick reaction; in the age-period 5-10 years, 80·0 per cent. gave a positive reaction; in the 10-15 years age-period, 67·9 per cent.; 15-20 years, 64·5 per cent.; and 20-25 years, 54·2 per cent. The figures for the later age-periods are too small to have any statistical value.

Susceptibility to Diphtheria according to Sex.—Table VI. (see p. 8) shows the results in males and females respectively, according to age-period, of the Schick test carried out in the same 1,500 individuals, and in the table the result of the Dick and Schick tests can be readily contrasted. It is found that, in the 0-5 years age-period, 83·3 per cent. of males were Schick-positive as compared with 96·8 per cent. of females who were Schick-positive. In this age-period, however, the numbers are too small to provide reliable data. In the 5-10 years age-period, 81·5 per cent. of males were positive as compared with 80·6 per cent. of females; in the 10-15 years age-period, 65·1 per cent. males to 74·4 per cent. females; in the 15-20 years age-period, 68·4 per cent. males to 88·5 per cent. females; and in the 20-25 years age-period, 47·6 per cent. males to 75 per cent. females. In this age-period the numbers are again too small to provide reliable data.

Susceptibility to Diphtheria according to Social Condition.—Table VII. (see p. 9) shows the results of susceptibility to diphtheria according to social condition, as contrasted with susceptibility to scarlet fever. In this connection, 708 children from west-end schools have been tested, 376 children from middle class schools, and 404 children from east-end schools. It is found that, of west-end school children, 556, or 78·5 per cent., were Schick-positive; of middle class school children, 235, or 62·5 per cent., were Schick-positive; while, of east-end school children, 126, or 31·2 per cent., were Schick-positive.

Susceptibility to Diphtheria of Persons who gave a History of having formerly suffered from the Disease.—Some 105 persons who had previously suffered from diphtheria have also been Schick-tested, and reference to foot-note to Table V. (see p. 8) shows that 43 of these, or 41·0 per cent., were Schick-positive. It was also observed that the Schick reaction in the majority of these positive cases was less intense than in individuals who had not suffered from diphtheria.

The Schick Susceptibility Test in Cross-infected Wards.—The Schick test has also proved of the utmost value as a guide to the susceptibility to diphtheria of nurses and patients in wards in which cross infection with diphtheria has taken place or in wards to which cases of diphtheria may be accidentally admitted. Thus, all patients on admission to the scarlet fever wards are immediately Schick-tested,

and if a case of diphtheria has recently occurred in the ward then all positive Schick reactors can be protected by a passively immunising dose of diphtheria antitoxin.

The experience has been that Schick-negative reactors can be left in contact with doubtful cases of diphtheria, or even with actual cases of the disease, without contracting diphtheria. Not infrequently it has been necessary, owing to lack of isolation accommodation, to leave in the scarlet fever ward a scarlet fever patient who is also suffering from diphtheria or is a diphtheria carrier, and it has been found possible to prevent cross infection by the comprehensive use of the Schick susceptibility test and passive immunisation of positive reactors as above indicated.

A measure of the effects of this diphtheria prophylaxis can be obtained by comparing the incidence of diphtheria in scarlet fever patients admitted to the City Hospital, on the one hand, with the incidence of diphtheria in the patients admitted to the Royal Hospital for Sick Children, on the other hand. It is found that, in all, 8 cases of diphtheria were notified as occurring among the 1,179 scarlet fever patients admitted from January, 1925, to September, 1926, to the City Fever Hospital, where preventive measures were in force, whereas 42 cases of diphtheria were notified as occurring in the Royal Hospital for Sick Children, where a total of 1,869 cases were treated during the period mentioned. In other words, 0·7 per cent. of cases of diphtheria occurred among the scarlet fever patients in the City Hospital, as contrasted with 2·2 per cent. of cases of diphtheria in the patients in the Royal Hospital for Sick Children, and it is notorious that scarlet fever patients are particularly susceptible to diphtheria. Not only so, but all of these 8 diphtheria cases as appearing in scarlet fever patients at the City Hospital occurred within four days of admission of the scarlet fever patients, and prior to the readings of the positive Schick tests and the administration of diphtheria antitoxin.

Prevention of Scarlet Fever and Diphtheria by Immunisation.

The newer knowledge of scarlet fever and diphtheria has made it possible to secure protection against these diseases either by methods of active immunisation or by methods of passive immunisation, and both require consideration.

It is important here to refer briefly to current theories relating to the nature and degree of the active immunity conferred by various forms of vaccination. One aspect of the subject has been reviewed by Ledingham (1925) in his Harben Lectures. According to this investigator, the available bacteriological evidence would go to indicate that the immunity induced by a vaccine composed of living organisms, the virulence of which has been diminished by one or other of the known methods of attenuation, is the only form of immunity that has some permanence. As outstanding examples of such an enduring active immunity, the immunity conferred by vaccination against small-pox and anthrax may be quoted. The available bacteriological evidence would appear to indicate that the immunity phenomena induced by vaccines composed of dead organisms is much less enduring, and such vaccination, so far as the bacteriological evidence goes, is to be regarded as a prophylactic device of doubtful value, as, for example, in vaccination against enteric fever, notwithstanding the strong statistical evidence in

favour of this preventive device. It is concluded, therefore, that since the immunising response to a vaccine of dead organisms is much more feeble than the immunising response to a vaccine consisting of living organisms, then it is more than probable that the immunising response to an exotoxin alone will be of the feeblest description and in practice negligible in amount.

On the other hand, Glenny (1925) has shown that the injection of a toxin into an animal not only acts as a stimulus to antitoxin production but also increases the power of an animal to produce antitoxin, that this power remains although all antitoxin may gradually be lost, and that potential immunity remains and probably continues through life. Glenny has further shown that though a small primary stimulation may result in no appreciable production of antitoxin, the second injection will immediately stimulate the body to produce antitoxin in large amount. In other words, he has shown that the power of production of antitoxin is independent of the antitoxin content of the blood. It is difficult to reconcile Ledingham's views with Glenny's findings.

Such conclusions are based wholly on the available results of experimental bacteriology, and further experimental work may modify and reconcile such views. Not only so, but all the experimental work dealing with susceptibility to diphtheria and scarlet fever indicates that susceptibility to these diseases steadily diminishes as age increases, it being assumed that this increasing insusceptibility is conferred on the individual by the repeated absorption of non-infective doses of living diphtheria and scarlet fever organisms respectively; and accordingly if Ledingham's view as to the necessity of a living virus for immunising purposes be admitted, then it follows that this immunity of age is in the nature of a permanent immunity, and this is strongly substantiated by consideration of the incidence of diphtheria and scarlet fever. It can reasonably be argued, therefore, that even if injections of toxin do not stimulate the whole immunity mechanism, the stimulation of which is requisite for the induction of a permanent immunity, nevertheless the immunity processes induced by injections of toxin may be sufficient to afford protection during the more susceptible years of life and until the permanent immunity has been induced by the repeated absorption of non-infective doses of the living organisms.

Prevention of Scarlet Fever by Active Immunisation—Scarlatinal Streptococcus Toxin.

Reference has already been made to the impracticability of using laboratory animals for standardising scarlatinal streptococcus toxin, and to the necessity of using the Dick test in man for standardising the dosage of scarlatinal streptococcus toxin, the immunity response resulting from injections of streptococcus toxin being determined by Dick-testing from time to time.

In beginning an immunising campaign against scarlet fever either as applied to the inmates of a hospital or to the community generally, at a time when no standardised scarlatinal streptococcus toxin had been put on the market, it will be obvious that it was necessary to carry out an extended series of inoculations on volunteers before we were satisfied that the toxin that was to be employed was stable, that in the doses selected it was relatively non-toxic, and that it produced a sufficiently permanent immunising response. We are indebted to many medical

students and nurses who offered themselves freely for these preliminary inoculations. The difficulty which was found in standardising the toxin for the Dick susceptibility tests, which has already been referred to, was also encountered in standardising the toxin for immunisation purposes. Thus, in one of the series of preliminary experiments, six susceptible individuals were each given as a first immunising injection 500 skin doses of a toxin, one skin dose of which had previously been found to give good positive reactions in susceptible children and negative reactions in convalescent cases of scarlet fever. Within twelve hours of receiving the 500 skin doses, three of the individuals had marked swelling and induration at the site of the injection accompanied by pyrexia, malaise, headache, and vomiting; while in the other three, swelling and induration of the arm alone were noted. This experiment indicated that the amount of the toxin was excessive for immunising purposes, and that further dilution of the toxin was necessary.

At the same time it was obvious that it is of the utmost importance that the toxin should be of sufficient strength to produce a permanent immunising response. Thus, when a weaker toxin was substituted for the stronger toxin which produced the constitutional disturbances above described, three of a second series of six children who had become Dick-negative reactors with the weaker toxin within a fortnight of the third injection were found to have become Dick-positive two months later. It was thus necessary to use the strongest toxin that would be tolerated without producing a general disturbance in the vast majority of susceptible individuals. In practice it has been found that a toxin, 500 skin doses of which produce a general erythema in about 3 per cent. of the inoculated individuals, meets this requirement. The appearance of this erythema following on the first immunising injection of 500 skin doses does not contraindicate the two remaining injections of 1,000 and 3,000 skin doses respectively of toxin being given, the remaining two doses being commonly tolerated without further reaction.

In all the experiments here recorded, the unmodified toxin as prepared in our own laboratories has been used for immunising purposes, severe reactions being eliminated by the employment of three graduated doses of the toxin injected at weekly intervals, the first injection consisting of 500 skin doses, the second of 1,000 and the third of 3,000 skin doses. The injections are made subcutaneously into the upper arm about the insertion of the deltoid muscle. It has been found that in children under 6 years of age the reaction produced by such injections is negligible. It has also been found that the immunity to scarlet fever, as judged by a negative Dick reaction following on the streptococcus toxin injections, develops much more rapidly than the immunity to diphtheria following on toxoid-antitoxin injections—the immunity to scarlet fever commonly appearing two weeks after the third injection.

Active Immunisation against Scarlet Fever of Nursing Staff of City Hospital.—Since 1st June, 1295, the nursing staff of the City Hospital have been actively protected against scarlet fever before being admitted for duty to the scarlet fever wards. Reference to Table VIII. shows that of 122 nurses Dick-tested, 32, or 26·2 per cent., were susceptible to scarlet fever, as indicated by a Dick-positive reaction; and of 29 maids Dick-tested, 7, or 24·1 per cent., were found Dick-positive.

Table VIII.

Dick Test and Active Immunisation against Scarlet Fever.
From 1st June, 1925, to 30th September, 1926.

No. of nurses Dick-tested		122
No. of nurses immunised up to present date		32
No. of maids Dick-tested		29
No. of maids immunised		7
Results of Dick tests	Nurses—32 +	= 26·2%
	Maids — 7 +	= 24·1%

Results of Immunisation.

Nurses.—32 nurses immunised with 1 series of injections.
On re-testing 3 weeks later, 2 definitely +, and 1 faintly +.
On re-testing after 2nd series of injections, all −.

Maids.—6 received 1 series of injections, and all were Dick − on re-testing 1 month later.
1 received only 1 injection, as she developed a condition indistinguishable from scarlet fever 24 hours later.

	Average for years 1915-1925.
Average number of cases of scarlet fever (yearly) before immunisation started	Nurses—8·5 or 9·5%
Do. after immunisation started	,, 0

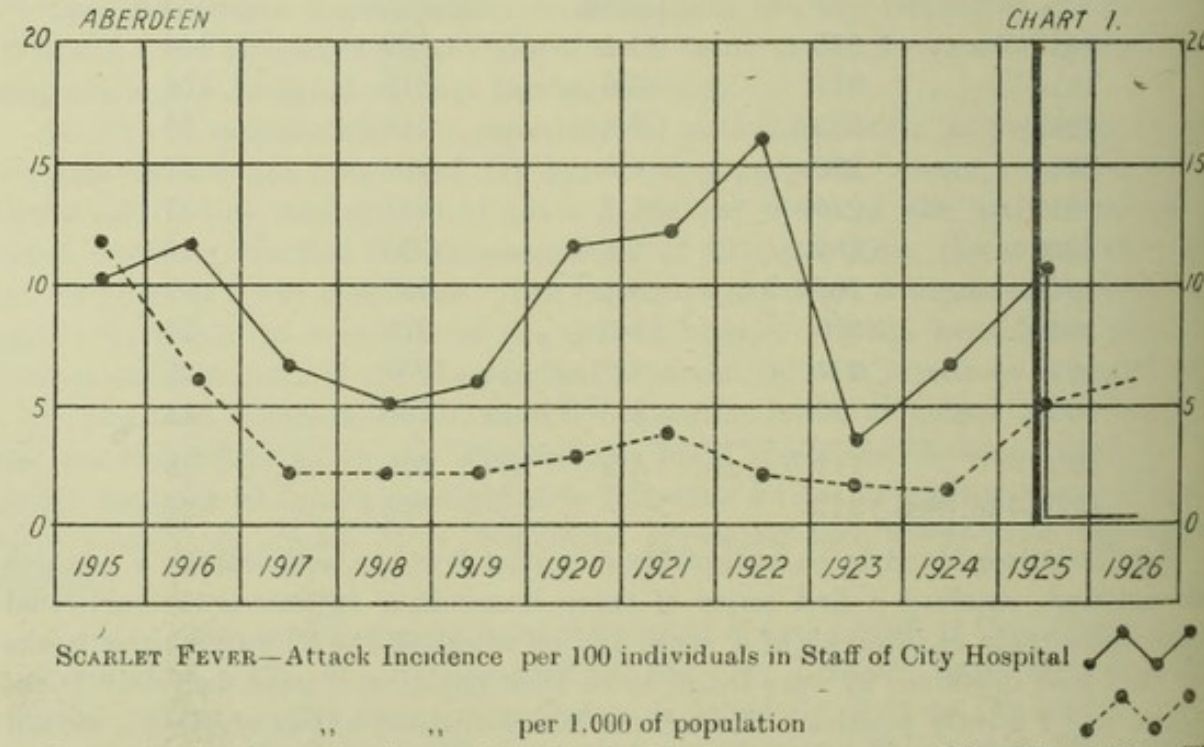
Scarlet Fever in Aberdeen.

Year.	No. of Cases.	Cases per 1,000 of Population.	No. of Cases in Hospital.	Average daily No. in Hospital.
1915	1,873	11·5	1,267	144
1916	917	5·6	812	108
1917	283	1·8	245	33
1918	290	1·8	204	27
1919	270	1·7	247	31
1920	409	2·6	359	46
1921	706	4·4	532	62
1922	310	1·9	272	26
1923	271	1·7	237	22
1924	197	1·3	185	15
1925	712	4·5	621	58
1926(Jan.-Sep.)	612	—	558	68

The 32 nurses found to be susceptible to scarlet fever as indicated by a positive Dick reaction, received a first series of three immunising injections of scarlatinal streptococcus toxin at intervals of a week, and on retesting the 32 nurses three weeks after the third injection, 29 were found to be Dick-negative, 2 were definitely Dick-positive, and 1 faintly positive. These three last-mentioned nurses received a second series of immunising injections, and on retesting three weeks later, all were Dick-negative. Of the 7 maids who were found to be susceptible to scarlet fever, 6

received one series of three immunising injections at intervals of a week, and all 6 were found to be Dick-negative on retesting one month later. The remaining maid, who had been found to be Dick-positive, received only one injection of 500 skin doses of toxin, since following this injection she developed a condition indistinguishable from scarlet fever twenty-four hours later, and following on the illness she was found to be Dick-negative. On retesting these nurses and maids in September, 1926, all of them were Dick-negative.

Effect of Active Immunisation in Prevention of Scarlet Fever in City Hospital Staff.—With regard to the occurrence of scarlet fever in the 122 nurses and 29 maids who have been Dick-tested since 1st June, 1925, and of whom 32 nurses and 7 maids were found to be Dick-positive and were not put on duty in the scarlet fever wards until they had been protected, there has been no case of scarlet fever. This is a really astonishingly successful result. Thus, during the 10 years 1915-1924, an annual average of 8·5 nurses, or 9·5 per cent., contracted scarlet fever in the City Hospital, and an annual average of 1·4 maids, or 4·2 per cent., similarly contracted scarlet fever in the City Hospital. During the same decennium, as shown in Table VIII., the annual average of the incidence of scarlet fever in the population of Aberdeen was 3·4 per 1,000 of the population. The average daily number of scarlet fever patients in the City Hospital during these ten years was 51·4. In 1925, however, scarlet fever reached epidemic proportions early in September, and the case-incidence of scarlet fever in the City in 1925 was 4·5 per 1,000 of the population, and the average daily number of scarlet fever patients in hospital during the year was 58. These figures are represented in Chart No. 1 given below, and Table VIII. on page 15.



Note.—Active immunisation against Scarlet Fever was commenced in July, 1925. The total number of individuals (nurses and maids) on the staff of the City Hospital may be put at 125. The disease was in epidemic form in 1921 and 1925-26.

As already stated, it is astonishing that during the 10 years when the case-incidence of scarlet fever per 1,000 of the population reached as low a level as 1·2, as in 1924, and during which 10 years the case-incidence of scarlet fever in the nursing and domestic staff never reached a lower level than 4 per cent. of the staff, as in 1923, and reached as high as 16 per cent. of the staff in 1922, nevertheless in 1925, with a case-incidence of 4·5 per 1,000 of the population suffering from scarlet fever and with a daily average in hospital of 58 cases, coincident with the active immunisation of the staff, scarlet fever disappeared in the staff. These figures relating to the actual protection of the nursing staff against scarlet fever afforded by active immunisation provide the only statistical data that are yet available in the immunising campaign, and it will be obvious that it is much too early to dogmatise in the matter; but the figures are very encouraging, and since the hospital draws a large proportion of its nursing staff from rural areas, and since the inhabitants of rural areas are on the whole more susceptible to scarlet fever, the effect of active immunisation on the nursing staff is subject to this wider interpretation.

It has been found, however, that coincident with the disappearance of scarlet fever in the immunised nursing staff of the City Hospital, there has been a notable increase in the incidence of streptococcal tonsilitis in these immunised nurses. Thus, in the decennium of 1916-1925 there was an annual average of 11 cases of tonsilitis in the 95 nurses comprising the nursing staff, or a case incidence of 11·6 per cent., whereas in the year October, 1925, to September, 1926, the number of cases was 25, or 26·3 per cent. It has been shown than an annual average of 9 cases, or 9·5 per cent., contracted scarlet fever in the City Hospital, and, if this number is subtracted from the 25 cases of tonsilitis, it leaves an average annual number of 16 nurses suffering from tonsilitis, or 16·8 per cent. In other words, the increased incidence of tonsilitis in the nursing staff during this period of the epidemic prevalence of scarlet fever may be wholly explained if it be assumed that such an immunity as is induced by injections of the exotoxin of *S. scarlatinæ* fails to protect the immunised nurses from tonsilitis due to this streptococcus. The streptococci obtained from these tonsilitis cases in nurses commonly fall into one or other of the serological groups of scarlatinal streptococci, and it would appear therefore to be proved that the immunised nurses, while protected by immunisation from the toxic effects of the exotoxin of *S. scarlatinæ*, are in no wise protected against tonsilitis due to this streptococcus (see p. 19 for further discussion of this problem).

Active Immunisation against Scarlet Fever of Patients admitted to Hospital with Diphtheria.—As will be shown later (p. 25), advantage is taken of the admission of cases of scarlet fever to the City Hospital to test all such patients for susceptibility to diphtheria, and to provide a first series of diphtheria toxoid-antitoxin injections to those found to be susceptible. In the same way, on the admission of all cases of diphtheria to hospital, sanction is obtained to provide active immunisation against scarlet fever for these patients, and all such patients are Dick-tested on admission. It has not been found practicable, however, to proceed with the active immunisation of the Dick-positive reactors while in hospital, because the scarlatinal prophylactic produces an erythema in 3 per cent. of the individuals immunised, this erythema

introducing a serious difficulty in the differential diagnosis of the rash due to toxin, of serum rash, and of the rash of scarlet fever. It is better, therefore, to postpone the active immunisation of the Dick-positive reactors among the diphtheria patients until after they are discharged from hospital.

Active Immunisation of School Children against Scarlet Fever.—After five months' experience of the apparently effective protection provided to the City Hospital nurses by active immunisation against scarlet fever, it was considered that the results justified a wider application of this preventive procedure, and, accordingly, in November, 1925, sanction was obtained from the Education Authority to provide active immunisation against scarlet fever to school children. In all, 303 school children have, to the end of September, 1926, received a first series of immunising injections of the scarlatinal prophylactic. Of these 303 children, 257 were retested within four months of receiving the first series of injections, and of these, 194, or 75·6 per cent., were found protected, as indicated by a negative Dick reaction. None of these 194 protected children subsequently contracted scarlet fever, though the disease has been rife in the schools. *One* child, two months after having received a first series of injections, not having been retested in the interim, developed scarlet fever.

Prevention of Return Cases of Scarlet Fever.—The problem of the return case of scarlet fever was apparently insoluble until active immunisation became possible. Thus, since the beginning of hospital isolation of scarlet fever, patients have been discharged from hospital apparently well, and, within a few days to a month of their return home, have originated fresh cases of scarlet fever. It is true that many of these apparently clean discharged cases that originated return cases were, on later examination, found to be suffering from discharges of one kind or another, but it has been the experience of every one associated with fever hospital practice that on occasion, the convalescent patient, discharged from hospital without any discharges whatsoever and apparently free from all infection, has originated fresh cases.

It occurred to us that active immunisation against scarlet fever might profitably be employed for the protection of all susceptible members of the families to which scarlet fever convalescents were discharged from hospital. We accordingly took steps to have every family, from which a case of scarlet fever had been removed to hospital, visited within twenty-four hours, and all the remaining members of the family Dick-tested. The results of these Dick tests are noted after twelve hours, and all positive reactors are given a first immunising injection of 500 skin doses of scarlatinal streptococcus toxin, 5 days later a second injection of 1,000 skin doses, and 5 days later a third injection of 3,000 skin doses, and, within 14 days of the third injection (that is 24 days after the case of scarlet fever had been removed to hospital), these susceptible contacts are found, in the great majority of cases, to be immune, as judged by a negative Dick reaction. Accordingly, when the scarlet fever patient is discharged from hospital, he returns home to a family, the susceptible members of which have all been immunised against scarlet fever. Up to the end of September, 1926, some 470 families have been visited, and arrangements made with 134 of the

families to have the susceptibility tests and necessary immunising injections provided by the family doctor. In 84 out of the 470 families, the patient admitted to hospital was an only child. The members of the remaining 252 families have been tested and immunised under the supervision of the Health Department. The results of the Dick tests, as already recorded, indicate that it is unnecessary to Dick-test children under 6 years of age, since 96·4 per cent. of such children are Dick-positive; and, accordingly, it has been possible to actively immunise without preliminary testing 277 children in the 252 families. An additional 233 children over 6 years of age in these families have been Dick-tested, and of these, 154, or 66·1 per cent., have been found positive, and these positive reactors have been similarly actively immunised against scarlet fever. It is interesting to note that, up to the time of reporting, only one return case of scarlet fever has occurred in the 252 families which have been thus protected. During the quinquennium 1921-1925, an annual average of 439 cases of scarlet fever were notified, an annual average of 369 cases were admitted to hospital, and these hospital admissions on discharge caused an annual average of 22 return cases, or 5·9 per cent. of admissions. During the period August, 1925, to September, 1926, 1,027 cases of scarlet fever have been notified; 661 cases from non-immunised households have been admitted to hospital where they received serum treatment; and these on discharge have caused 13 return cases, or 2·0 per cent. of admissions; while 252 cases from households which were immunised while the patients were in hospital, have similarly received serum treatment in hospital, and these on discharge have caused 1 return case, or 0·4 per cent. of admissions. The contrast, therefore, is that among the non-immunised families, from 2·0 per cent. to 5·9 per cent. of scarlet fever admissions on discharge have caused return cases, whereas the discharge of 252 cases to immunised households has produced 0·4 per cent. of return cases.

Control of Epidemic Prevalence of Scarlet Fever by Active Immunisation.—The results already recorded of the Dick test for susceptibility, of actively immunising and retesting susceptible individuals, indicate that in about 95 per cent. of cases the Dick-positive reactors become Dick-negative a fortnight after the third immunising injection, although this Dick-negative reaction may not be permanent. Therefore, the immunity to scarlet fever induced by streptococcus toxin develops much more rapidly than that to diphtheria induced by diphtheria toxoid-antitoxin injections. With diphtheria six weeks to six months are needed for immunity to develop. With scarlet fever the period required is much shorter, consequently the prospect of promptly checking the extension of the disease is hopeful. Toxoid-antitoxin injections fail to control epidemics of diphtheria immediately. In the immunising campaign which is being undertaken in Aberdeen, epidemic control is being attempted, but obviously it will take a considerable time to collect statistics for publication.

The Exotoxin of S. Scarlatinæ and its Detoxification.

The exotoxin of *S. scarlatinæ* used in this investigation has been obtained by growing a strain thereof in Hartley's Trypsin broth for twenty-four hours.

Various types of Chamberland, Berkfeld, and Seitz filters have been employed to obtain the germ-free soluble exotoxin with uniform success. The toxin has been standardised by comparing the reactions produced by various dilutions of the new toxin with the reaction produced by the diluted standard toxin on normal children, on acute cases, and on convalescent cases of scarlet fever. The actual Dick-test dose varied between 0·2 c.c. of 1 in 1,000 dilution of one toxin to 0·2 c.c. of a 1 in 2,000 dilution of another. As already indicated, graduated doses containing 500, 1,000, and 3,000 such skin test doses have been used for producing active immunity. This scarlet fever toxin in the doses indicated produces in certain individuals marked local and general disturbances. Within 24 hours of injection, local redness with swelling of the arm appears, while in very markedly susceptible individuals, general symptoms may develop within a few hours. These consist of fever, vomiting, and exanthem varying from slight erythema to a typical scarlatiniform rash. Except in very exceptional cases, the whole of the symptoms disappear within 24 hours. The reactions appear most frequently after the first dose, and much less frequently after the second. *In exceptionally susceptible individuals, however, it has been repeatedly found that the whole clinical picture of scarlet fever going on to marked desquamation is produced by the subcutaneous injection of the exotoxin derived from the S. scarlatinæ.* This phenomenon is well known to the general medical practitioners of Aberdeen who have been taking part in the immunising campaign, but it may not be fully appreciated by those who have merely been following the literature on this subject.

Clearly the most urgent requirement of the present campaign is the production of a detoxified scarlatinal streptococcus toxin or toxoid for immunising purposes so that immunisation is induced with fewer doses, intensifying the immunity produced and so making it more enduring, and eliminating the local and constitutional reactions that the unmodified toxin produces. The unmodified toxin, as used in the experiments already described, produces a scarlatinal erythema indistinguishable from the rash of scarlet fever in 3 per cent. of the persons inoculated. Accordingly, a streptococcus toxin detoxified with 2 per cent. sodium ricinoleate, in accordance with the method of Larson, Evans, and Nelson (1924), has been prepared, and attempts have been made to confer immunity with one inoculation of 2,000 to 4,000 skin doses of this soap mixture to two groups of three children in hospital, these children having previously proved Dick-positive. The following was the result:—

Init.	Age.	Sex.	Scar. Fev. before.	Dick Test.			Prophylactic.		Reactions.		Dick Retest. Skin Doses.			
				Date. 1925.	+	—	Amount.	Date. 1925.	Local.	General.	1	5	10	20
J.M.	3½	M	0	18 Nov.	+ +		2000S.D	20 Nov.	Nil	Nil	—	+	+	+
C.C.	5	M	0	,,	+ +		2000S.D	,,	Slight	Nil	—	+	+	+
J.B.	2½	M	0	,,	+ +		2000S.D	,,	Nil	Nil	—	+	+	+
J.B.	5	M	0	,,	+ +		4000S.D	,,	Slight	99·4° F.	—	—	+	+
G.D	3½	M	0	,,	+ +		4000S.D	,,	Nil Slight Rash	99·2° F.	—	—	+	+
G.B.	4	M	0	,,	+ +		4000S.D	,,	Slight Slight Rash	99·0° F.	—	—	+	+

Thus it will be seen that the three children who each received an injection of 2,000 skin doses, when Dick-tested two months later, were negative to 1 skin dose but positive to 5, 10, and 20 skin doses; while the three children who had received 4,000 skin doses as a single injection, and who had reacted with a slight elevation of temperature and an evanescent erythematous rash, were negative to 1 and 5 skin doses but positive to 10 and 20 skin doses.

In the present state of the bacteriological investigation, however, we have not been prepared to make use of this soap toxin mixture in out-patients, since there is a possible danger that the ricinoleate wraps round or absorbs the toxin only temporarily, and that the whole of the toxin may under certain circumstances again be released. There is no serious danger in experimenting with such special toxin mixtures in in-patients, since were symptoms of intoxication to appear in these patients in hospital, they could be immediately neutralised by the exhibition of anti-streptococcic serum. As a control to the experiment recorded above, *4,000 skin doses of untreated scarlatinal streptococcus toxin have been injected into a volunteer medical student, with the result that in 24 hours he had a punctate erythema, scarlatinal tongue and throat; in short, his condition was indistinguishable from clinical scarlet fever. In ten days' time he desquamated, and two months later he was found to be Dick-negative.*

It is obvious, therefore, that the whole symptomatology of scarlet fever is due to the action of the exotoxin of *S. scarlatinæ*. That this is so, and that the symptoms are not produced by a filterable living virus which might be associated with the filtered exotoxin, is proved by the fact that the filtrate containing the exotoxin is still capable of producing the whole symptomatology of scarlatina in susceptible individuals after the filtrate has been heated to 55° C. for one hour. It further follows that, in producing active immunity by doses of *S. scarlatinæ* toxin, the immunity conferred prevents only the effects produced by the exotoxin alone, and has no effect in preventing infection by the scarlatinal streptococcus.

As already indicated, we have not felt justified in making any extended application of the scarlatinal toxin modified by sodium ricinoleate for purposes of immunisation, since experiments on laboratory animals with diphtheria toxin detoxified with sodium ricinoleate have seemed to justify the view that the ricinoleate absorbs the toxin only temporarily, and that the whole of the toxin may, in certain circumstances, be abruptly released. Accordingly, attention has been concentrated on making available a streptococcus anatoxin by modifying the toxin by treatment with formalin. Greater difficulty has been experienced in converting scarlatinal toxin into toxoid than with diphtheria toxin, but a potent non-irritant anatoxin which, it is hoped, will profoundly facilitate the immunising campaign against scarlet fever, has been prepared. The results of this investigation will be published in due course.

Prevention of Diphtheria by Active Immunisation—Diphtheria Toxoid-Antitoxin.

It is unnecessary to give a detailed description of the experimental work that has placed active immunisation against diphtheria by means of toxin-antitoxin injections on a sound experimental basis. The present development of active immunisation against diphtheria is due to the work of Park (1918) and his collaborators, and in particular of Zingher (1916). As stated in the *Medical Research Council Monograph on Diphtheria* (1923), precise details of the most satisfactory mixtures have been published, together with full accounts of technique and results in many thousands of cases. In the progress of the community application of this protective device against diphtheria in various countries, serious but fortunately rare accidents have occurred, notably in America and Austria, as a result of the dissociation of the toxin-antitoxin mixture with resultant liberation of the toxin. Such dissociation of toxin has been attributed variously to faulty preparation and to cold storage of the mixtures. The danger of such accidental poisoning has been entirely eliminated by the substitution of diphtheria toxoid for diphtheria toxin in the mixtures. With the toxoid-antitoxin mixtures which are now used for actively immunising against diphtheria, 3 doses of 1 c.c. each of the toxoid-antitoxin mixture are injected at weekly intervals into susceptible individuals (as indicated by a positive Schick reaction), the injection being made subcutaneously into the upper arm about the insertion of the deltoid muscle. These toxoid-antitoxin mixtures have replaced the various mixtures of toxin and antitoxin which were previously used for producing immunity to diphtheria. "Toxoid," which has now superseded "toxin" for purposes of immunisation, is defined as toxin so modified that it no longer possesses its poisonous properties, the change being brought about by exposing toxin to the action of 0·1 per cent. formalin at 37° C. for about four weeks. It has been found that the antigenic or immunising properties of the toxoid are much superior to those of the original toxin. In practice it has not been found possible to convert the last trace of toxin into toxoid. A small amount of antitoxin (27 units) is therefore added to 20 c.c. of toxoid. The mixture is then diluted ten times, and 1 c.c. is used as the dose for producing immunity.

Active Immunisation against Diphtheria of Nursing Staff of City Hospital.—Since 1st January, 1922, the nursing staff of the City Hospital have been actively protected against diphtheria before being admitted for duty to the diphtheria wards. As already mentioned, the experimental work has shown that active immunity to diphtheria takes from six weeks to six months to develop after the immunising injections have been given, and, accordingly, in order to prevent diphtheria in the City Hospital nurses, it was necessary to make arrangements to Schick-test all nurses on admission, to arrange that the Schick-positive reactors would be confined to duty in the tuberculosis wards and scarlet fever wards (and, in the latter case, only when they had been protected against scarlet fever) for a period of six months or until such time as the retests following the series of immunising toxoid-antitoxin injections showed that the Schick-positive reactors had become Schick-negative. Reference to Table IX. shows that of 126 nurses Schick-tested, 50, or 39·7 per cent., were susceptible to diphtheria as indicated by Schick-positive reaction; and of 30 maids Schick-tested, 11, or 36·7 per cent., were found Schick-positive.

Table IX.

Schick Test and Immunisation against Diphtheria.

From 1st January, 1922, to 30th September, 1926.

No. of nurses Schick-tested		126
No. of nurses immunised up to present date		47
No. of maids Schick-tested		30
No. of maids immunised		10
Results of Schick tests	Nurses—50+	=39·7%
	Maids —11+	=36·7%

Results of Immunisation.

Nurses.—42 nurses immunised with 1 series of toxoid-antitoxin injections.

5 nurses immunised with a second series of toxoid-antitoxin injections.

3 nurses (not immunised) received only 1 immunising injection on account of severity of protein reaction.

Maids.—9 maids immunised with 1 series of toxoid-antitoxin injections.

1 maid required second series of toxoid-antitoxin injections.

1 maid (not immunised) received only 1 injection of toxoid-antitoxin on account of the severity of the protein reaction.

	Average for years 1915-21.	
Average number of cases of diphtheria (yearly) before immunisation started	Nurses—12·4 or	14%
Do.	Maids — 1·3 or	4%
Do. after immunisation started	Nurses— 1·5 or	1·6%
Do.	Maids — 0·5 or	1·7%

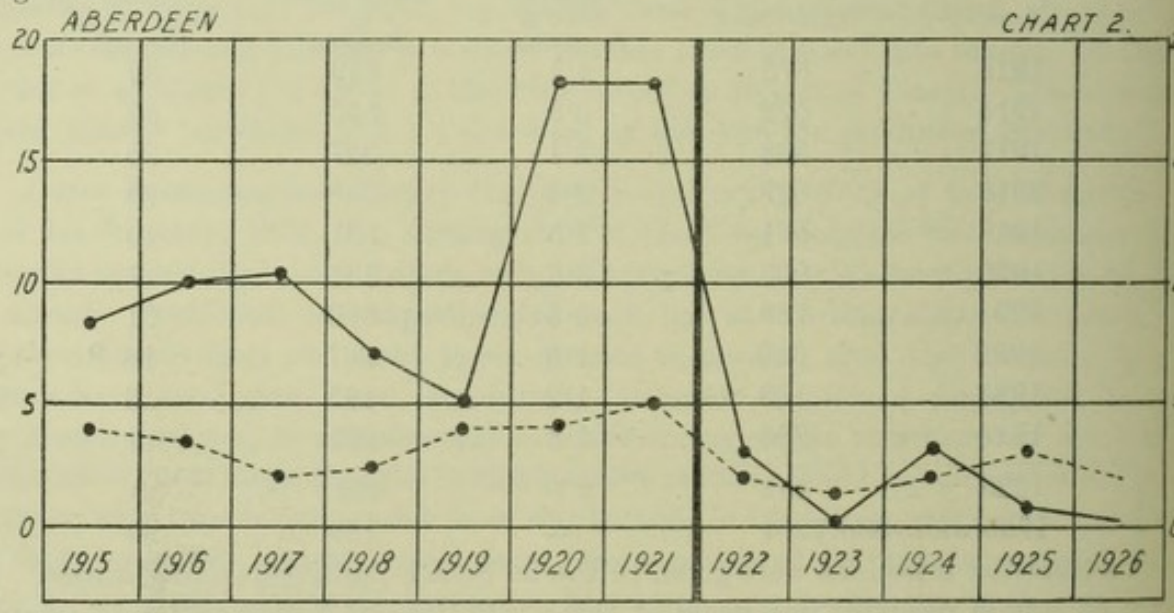
Diphtheria in Aberdeen.

Year.	No. of Cases.	Cases per 1,000 of population.	No. of Cases in Hospital.	Average daily No. in Hospital.
1915	675	4·1	618	35
1916	572	3·5	553	35
1917	338	2·1	327	25
1918	357	2·2	348	29
1919	561	3·5	531	40
1920	560	3·5	531	47
1921	733	4·6	682	51
1922	292	1·8	287	16
1923	189	1·2	183	12
1924	286	1·8	281	19
1925	432	2·7	423	30
1926(Jan.-Sep.)	201	—	189	20

Immunising injections were given to the 50 Schick-positive reacting nurses. Of these, 42 nurses receiving one series of three injections of toxoid-antitoxin mixture were found to be Schick-negative six months after they had received the injections, while 5 nurses who had received a first series of injections were still Schick-positive after six months. A second series of immunising injections to these 5 nurses resulted in their becoming Schick-negative when tested six months later. The remaining 3

nurses received only one immunising injection on account of the severity of the protein reaction. Since these severe reactions were encountered, it has been possible to immunise even these three nurses by initiating their protection afresh by repeated injections of small amounts of the toxoid-antitoxin mixture, beginning with one-tenth of a cubic centimetre. Of the 11 maids who have been found Schick-positive, 9 of the maids were found to be Schick-negative six months after one series of toxoid-antitoxin injections. One maid required a second series of injections before becoming negative, and one maid received only one injection of toxoid-antitoxin, and was not immunised on account of the severity of the protein reaction.

Results of Active Immunisation in Prevention of Diphtheria in City Hospital Staff.—With regard to the occurrence of diphtheria in the 126 nurses and 30 maids who have been Schick-tested since 1st January, 1922, and of whom 50 nurses and 11 maids were found to be Schick-positive and were not put on duty in the diphtheria wards until they had been protected, there has been in all 7 cases of diphtheria during the four years. This demonstrates the remarkable efficacy of the diphtheria prophylactic. Thus, during the seven years 1915-1921, an annual average of 12·4 nurses, or 14 per cent., contracted diphtheria in the City Hospital; and an annual average of 1·3 maids, or 4 per cent., similarly contracted diphtheria in the City Hospital. At the same time, as shown in Table IX., the annual average of the incidence of diphtheria in the population of Aberdeen was 3·4 per 1,000 of the population. The average daily number of diphtheria patients in the City Hospital during the ten years 1915-24 was 31. From 1922 to 1925, however, the case-incidence of diphtheria in the City has been 1·9 per 1,000 of the population, and the average daily number of diphtheria patients in hospital during these years has been 31. These figures are represented in Chart No. 2 given below, and Table IX. on page 23.



Diphtheria—Attack Incidence per 100 individuals in Staff of City Hospital

" " per 1,000 of population

Note.—Active immunisation against Diphtheria was commenced in January, 1922. The total number of individuals (nurses and maids) on the staff of the City Hospital may be put at 125.

It has to be noted that, prior to the institution of active immunisation in 1922, an average of 11 per cent. of the staff suffered annually from diphtheria, and, since 1922, an average of 1·6 per cent. The diphtheria incidence in the staff has been reduced from 18·4 per cent. in 1921 to 0-3·2 per cent. in the years 1922-25.

Active Immunisation against Diphtheria of Patients admitted to Hospital with Scarlet Fever.—Being convinced of the value of active immunisation against diphtheria in the City Hospital staff, occasion was taken a year ago to make this active protection against diphtheria available to scarlet fever patients admitted to hospital. Immediately on admission, scarlet fever patients are Schick-tested, and as soon as defervescence has occurred, the positive reactors receive a first series of three immunising injections of diphtheria toxoid-antitoxin. In this manner, 517 Schick-positive reactors suffering from scarlet fever have received a first series of immunising injections. These cases are being watched—they represent merely a trifling contribution to the numbers of Schick-positive reactors which are being immunised under the intensive immunising campaign which the Town Council have sanctioned.

Active Immunisation of School Children against Diphtheria.—As already stated, the evidence that had been obtained of the results of actively protecting the City Hospital staff against diphtheria justified a wider application of this preventive procedure, and, accordingly, steps were taken to provide active protection against diphtheria to school children—children under seven years of age being eliminated from this group as they were suitable for immunising with the combined diphtheria and scarlatina prophylactic (see p. 28). In all, 734 school children have, to the end of September, 1926, received a first series of immunising injections of the diphtheria prophylactic. Of these 734 children, 201 were retested at the end of six months, and of these, 164, or 81·6 per cent., were found to be protected, as indicated by a negative Schick reaction. None of these 164 protected children has contracted diphtheria, although 3 of the children who had received a first series of injections and who had not yet been retested, developed diphtheria within five months of receiving the injections.

Prevention of Return Cases of Diphtheria and Control of Epidemic Prevalence.—The immunity of diphtheria takes from six weeks to six months to develop, and, accordingly, this protective device is of no use in preventing return cases of diphtheria. For this purpose, Schick-testing and passive immunisation of the positive reactors forms the only effective procedure. The delay in the development of antitoxin in the blood of individuals who have received the immunising injections makes the active immunisation procedure useless for immediately controlling the prevalence of the disease. It is obvious that several years must elapse before any statistical evidence is obtained of the value of the present intensive community immunising campaign.

Active Immunisation against Diphtheria with Toxin Detoxified with Sodium Ricinoleate.—Reference has already been made to the results that it is hoped will

accrue from the use of a scarlatinal streptococcus toxin detoxified with sodium ricinoleate in the prevention of scarlet fever, and in a recent paper by Larson and Eder (1926) statistics are given of 578 cases treated with diphtheria toxin detoxified with sodium ricinoleate, of which 38·5 per cent. of the cases developed immunity within five weeks after one injection. The efficacy of this detoxified toxin may be measured by experiments on guinea-pigs.

Concurrent Active Immunisation against Diphtheria and Scarlet Fever—Diphtheria Toxoid Antitoxin and Scarlatinal Streptococcus Toxin—Combined Prophylactic.

Combined Diphtheria and Scarlatina Prophylactic.

In initiating the campaign for the active immunisation of the population against diphtheria and scarlet fever, it was early apparent that there would be great practical difficulty in the way of securing active immunisation of the population of Aberdeen against diphtheria and scarlet fever unless such immunity could be secured at one and the same time by a combined inoculation. Not only so, but it was evident that if a community campaign for protection against diphtheria by means of diphtheria toxoid-antitoxin was initiated and later it was found expedient to undertake a second community campaign for protection against scarlet fever, the response to the second campaign might be poor.

Experiments to determine Potency, Stability, and Safety of the Combined Diphtheria and Scarlet Fever Prophylactic.

The following experiments were undertaken with a view to testing whether the two prophylactics could be combined with safety and with a satisfactory immunisation response:—

1. *Toxicity Test on Animals.*

Diphtheria toxoid-antitoxin (B. W. & Co.) when injected into guinea-pigs is non-toxic in doses of 5 c.c.

To 5 c.c. quantities of diphtheria toxoid-antitoxin, 1 c.c. of streptococcus scarlatinæ toxin (15,000 skin doses) was added, and after allowing the mixture to stand for 24 hours at room temperature, this amount was inoculated into a series of guinea-pigs. No ill effects were observed.

Further tests were carried out with the same quantities after having been in admixture for two weeks, and again the response was found to be non-toxic.

These experiments served to demonstrate that no dissociation of the diphtheria toxoid antitoxin and streptococcus toxin resulted in the production of a toxic product.

2. *Test of Animal Immunisation Response, by O'Brien.*

Dr. O'Brien of the Wellcome Research Laboratories prepared a mixture of diphtheria toxoid-antitoxin and streptococcal toxin, and found that, when a series of guinea-pigs was inoculated with the mixture and another series was inoculated with diphtheria toxoid-antitoxin alone, the immunising power of the mixture (as estimated by the method of Allen and Glenny)

(1923), was only slightly less than the immunising power of the toxoid-antitoxin given alone. The response to the streptococcus toxin cannot, of course, be measured on animals.

3. *Amount of Streptococcus Toxin used in Mixtures.*

Depending on the strength of the streptococcus toxin as judged by various Dick tests, so the actual quantity of streptococcus exotoxin added to the diphtheria toxoid-antitoxin is modified. If, for instance, the streptococcus toxin contains 15,000 skin doses per c.c., then to 25 c.c. quantities of diphtheria toxoid-antitoxin there is added 0·8 c.c., 1·6 c.c., and 4·8 c.c. of streptococcus toxin; representing approximately mixtures containing 500, 1,000, and 3,000 skin doses per c.c.

If 1 c.c. of the third mixture is injected, the addition of streptococcus toxin means a reduction of the dose of diphtheria toxoid-antitoxin to 0·8 c.c. instead of 1 c.c. as usually recommended.

4. *Application to Man.*

The experimental work on laboratory animals with the combined prophylactic carried out as above indicated, appeared to demonstrate that the combined prophylactic could be used with safety and with a satisfactory immunising response in laboratory animals, and warranted its application to man. Taylor had already demonstrated the effect of the scarlatina prophylactic and the diphtheria prophylactic separately in the immunising of the City Hospital staff, in which, in a period of the epidemic prevalence of scarlet fever, the incidence of scarlet fever in the nursing staff had been reduced from 9·5 per cent. to 0, and in which the diphtheria incidence had been reduced from 14 per cent. to 1·6 per cent. His preliminary experiments in testing out the combined diphtheria and scarlet fever prophylactic on man were initiated in June, 1925—medical students and nurses being obtained as volunteers for the tests. It was rapidly ascertained that the local reactions from the combined injection were not of a severe nature, and that general disturbance and transient erythema occurred so rarely as to be negligible. In fact, the reactions obtained by the combined prophylactic have not been more serious than the reactions obtained by the scarlatinal streptococcus toxin alone.

In the first series of experiments, half a dozen volunteer medical students and nurses who had been found to be both Schick-positive and Dick-positive reactors, received concurrently as their first immunising injections 500 skin doses of streptococcus toxin into one arm, and 1 c.c. of diphtheria toxoid-antitoxin into the other arm. The reactions from these first injections being negligible, these volunteers received, a week later, an injection of the combined prophylactic containing 500 skin doses of streptococcus toxin and 1 c.c. of diphtheria toxoid-antitoxin; a week later they received a second injection of the combined prophylactic containing 1,000 skin doses of streptococcus toxin and 1 c.c. of diphtheria toxoid-antitoxin; and a week later they received a third injection of the combined prophylactic containing 3,000

skin doses of streptococcus toxin and 1 c.c. of diphtheria toxoid-antitoxin. Three months later, all the six volunteers were found to be Dick-negative and Schick-negative. These experiments were repeated on other volunteers, and the results as described above were confirmed. Further confirmation of these results was obtained by fully testing out the combined prophylactic on children under six years of age admitted to the tuberculosis and marasmus wards of the City Hospital. We were thus in a position to conclude that the combined prophylactic could apparently be used with as much safety as could the diphtheria prophylactic and scarlatina prophylactic when used separately.

Active Immunisation against Diphtheria and Scarlet Fever with Combined Prophylactic at Child Welfare Centres.

An abundance of experimental data goes to show that from 80 to 90 per cent. of children under six years of age are susceptible to both diphtheria and scarlet fever, as shown by positive Schick and Dick tests, and, accordingly, no preliminary Schick-testing or Dick-testing is required in children in this age-period, and the actively immunising injections can be straightway administered. This elimination of the preliminary Schick and Dick tests in young children is of great practical importance. Thus, in immunising such children separately against diphtheria and scarlet fever, it was found that a single series of injections of streptococcus toxin and diphtheria toxoid-antitoxin respectively result in from 70 to 80 per cent. of the inoculated children in this, the most susceptible age-period being protected. It is a matter of great practical moment in the immunising campaign that an assurance can be given to mothers that, by means of a single series of three injections of the combined prophylactic, some 75 per cent. of the children will be protected against both diphtheria and scarlet fever. Some experience is required in performing the Schick and Dick tests and in reading the results, and by eliminating the preliminary susceptibility tests, private medical practitioners, by administering the immunising injections, can co-operate in the community campaign to the greatest extent, while the preliminary tests in adults and older children and the retesting of the children who have received their first series of immunising injections can be undertaken by the medical staff of the Health Department.

Another consideration of great practical importance is to the effect that children under seven years of age tolerate the injections extremely well. Adults and older children are much more sensitive to the injection of foreign proteins, and this fact emphasises the desirability of the immunising injections being provided as soon as children are aged one year, and when, thereafter, the protection accorded will be available during the more susceptible years of the child's life. It is to be noted in passing that the immunity to scarlet fever and diphtheria, as indicated by negative Dick and Schick-reactions in children during the first year of life, is apparently passive in character, and is assumed to be obtained in utero from the mother's blood and from the mother's milk during lactation, and quickly decays. We have adopted the age-period of one year as the optimum period for the immunisation of children against diphtheria and scarlet fever after due deliberation. The susceptibility tests would

indicate that the six months age-period rather than the one year age-period is the optimum, but at six months, the normal child is teething, and at this age-period the pancreas is assuming its adult function. At the nine months' age-period, the normal child is possibly in process of weaning, and, accordingly, it has seemed best to defer the offer of immunisation against diphtheria and scarlet fever until the age-period of one year, at which age-period susceptibility to diphtheria and scarlet fever is still increasing.

Experimental data and hospital experience having indicated the safety and competency of the combined prophylactic, a beginning was made with the immunising of children over one year at the Child Welfare Centres in November, 1925, and, up to the end of September, 1926, 524 children have received a first series of immunising injections of the combined prophylactic. This experience of the immunising of the infant population, limited as it is, has impressed us with the urgency of the need for securing an immunising mixture that will provide protection against scarlet fever and diphtheria with the fewest possible number of injections. Even when the preliminary susceptibility tests are eliminated, it is found in practice that mothers are altogether reluctant to have their children retested after the first series of immunising injections, and for this reason, and in order to encourage the widest number of parents to secure this immunising device for their children, it is proposed to delay the retesting of these children until they enter school at the five year age-period.

Active Immunisation against Diphtheria and Scarlet Fever with Combined Prophylactic in School Children.

School children are more sensitive to the injection of the combined prophylactic than are children in the 0-5 year age-period, and in school children over 7 years of age, preliminary Schick and Dick testings are accordingly indicated. Susceptibility to one or other or to both diseases having thus been ascertained, the immunisation indicated can then be produced. The sanction of the Aberdeen Education Authority having been obtained to the comprehensive immunisation of school children in November, 1925, we accepted responsibility for the immunising procedure in the schools. An extensive series of susceptibility tests have been carried out on such children, and are recorded above. A total of 1,305 school children who were found to be Dick-positive and Schick-positive reactors received a first series of immunising injections of the combined diphtheria and scarlatina prophylactic. Of these 1,305 children, 151 were retested at the end of three months, with the following result:—121 of the 151 children, or 80 per cent., were found to be Dick-negative; 16, or 11 per cent., were found to be mildly Dick-positive; and 14, or 9 per cent., were markedly Dick-positive. Some 82, or 54 per cent., were found to be Schick-negative; 38, or 25 per cent., mildly Schick-positive; and 31, or 21 per cent., markedly Schick-positive. Again it has to be noted that statistical data of any value will not be available in connection with the effect of this immunising procedure in preventing the incidence of diphtheria and scarlet fever in school children for several years. Six of the 1,305 children who had received a first series of immunising injections of the combined prophylactic and who had not been re-tested developed scarlet fever—1, two months later; 2, four months later; 2, six

months later; 1, eleven months later. Two developed diphtheria—1, three months later; 1 eleven months later.

Passive Immunisation against Scarlet Fever and Diphtheria.

Passive Immunisation against Scarlet Fever.—Antistreptococcus serum for the specific treatment of cases of scarlet fever, for passively immunising against the disease, and for use in the Schultz-Charlton test, has been produced by injecting subcutaneously into animals either scarlet fever streptococci (Dochez) or the toxic filtrate standardised by the Dicks' method.

Whether the Dochez method, or the various modifications of the toxin, with or without killed or living streptococci, will finally be adopted, will depend largely on the value of an antimicrobial substance in the serum. In scarlet fever there are severe local infections, and at times even general infections together with the toxaemia, and, accordingly, it would appear that a potent serum should contain germicidal antibodies as well as antitoxin. The potency of the antitoxic serum can be tested by the Schultz-Charlton blanching test or by the more accurate Dick neutralisation test of the toxin. A streptococcus antitoxin unit has been adopted, viz.:—the amount of antitoxin that will neutralise 100 skin test doses of toxin as determined by an intracutaneous test in man. In producing passive immunity, a first essential is to ascertain whether the individuals to be immunised are susceptible to diphtheria or scarlet fever by means of the susceptibility tests since only positive reactors require protection. It is essential also that the prophylactic dose of the antistreptococcus serum in question should have been accurately determined.

Passive Immunisation of Scarlet Fever Contacts.—Whether it is better to actively immunise scarlet fever contacts by means of scarlatinal streptococcus toxin—this active immunity taking at least twenty-four days to develop from the date of the first immunising injection—or to protect them passively by means of an injection of scarlatinal antistreptococcus serum, has to be decided according to the circumstances of the case. Were it possible to immunise contacts passively by antistreptococcus serum and then proceed at once to produce an active immunity, there can be no doubt that all contacts would, in the first place, be passively protected. The presence of antistreptococcus serum in the blood of a passively immunised contact, however, interferes with the production of an active immunity by means of injections of streptococcus toxin, and in the case of passively immunised contacts, it is necessary to delay at least a month until the antitoxin has been eliminated from the body before giving the actively immunising injections.

The problem of controlling the spread of scarlet fever among contacts is more difficult than with diphtheria contacts, since, as yet, no bacteriological tests are available which can differentiate *S. scarlatinæ* from other toxin producing hæmolytic streptococci. In the case of diphtheria, moreover, the active immunity takes so long to develop that, as has already been indicated, there is no question of controlling the immediate spread of diphtheria by this means; but in practice, and as already indicated, in the section of this paper dealing with the control of return cases of scarlet fever (see p. 18), active immunisation of contacts rather than passive immunisation may, under certain circumstances, be justified. In other words, the ideal

procedure in the absence of a bacteriological test for *S. scarlatinæ* would be immediately to immunise passively all positive reactors among scarlet fever contacts, and to proceed a month later to produce an active immunity with streptococcus toxin. The increase in the number of injections and the length of time over which such injections have to be made, make contacts reluctant to secure such comprehensive protection.

Having in view the mild type of scarlet fever that at present prevails, the practice in Aberdeen is to allow contacts to take their chance of an immediate infection, and to urge the desirability of securing an enduring active protection. This applies to the limited number of contacts that occur in any private house. In the event of an outbreak of scarlet fever in an institution, however, or in the event of the cross infection of a diphtheria ward with scarlet fever, the withholding of a passively immunising injection from the contacts who are positive reactors could not be justified. On the contrary,under such circumstances scarlatinal antistreptococcus serum as a passively immunising agent provides a certain method of controlling the infection.

The following experience indicates the advantage that follows from knowing the susceptibility of contacts of scarlet fever as indicated by the readings of the Dick reactions, and the necessity for accurately determining the prophylactic dose of antitoxic serum. Table X. shows how, in the Royal Hospital for Sick Children, from the surgical wards of which a case of clinical scarlet fever had been removed, passive immunity was efficiently secured by first Dick-testing all the contacts and passively immunising the positive reactors with 2·5 c.c. or more of concentrated and unconcentrated antistreptococcic serums.

Table X.

Name.	Age.	Sex.	Scar. Fev. before.	Dick Test.		Scarlet Antitoxin.	Dick Retest.	
				+	−		+	−
A.H.	8/12	M	No	+		2·5 c.c. Serum No. 1 (conctd.)		—
M.A.	9/12	F	No	+		2·5 ,, ,, ,,		—
C.W.	4	M	No	+		5 ,, ,, ,,		—
M.D.	4	F	No	+		5 ,, ,, ,,		—
W.D.	8	M	No	+		5 ,, ,, ,,		—
A.S.	8½	M	No	+		5 ,, ,, ,,		—
C.G.	4	M	No	+		5 ,, ,, ,,		—
I.D.	1¼	F	No	+		5 ,, ,, ,,		—
A.D.	3½	M	No	+		10 c.c. Serum No. 2 (non-conc.)		—
D.F.	1½	M	No	+		10 ,, ,, ,,		—
D.P.	6½	M	No	+		10 ,, ,, ,,		—
E.S.	1¾	F	No	+		10 c.c. Serum No. 3 (non-conc.)		—
M.W.	2½	F	No	+		10 ,, ,, ,,		—
G.L.	2⅔	M	No	+		10 ,, ,, ,,		—
A.C	2¾	M	No	+		15 ,, ,, ,,		—

None of the above contacts contracted scarlet fever, and on retesting 24 hours after administration, the efficacy of this serum was indicated by the fact that all these Dick-positive reactors had become Dick-negative.

Table XI.

Name.	Age.	Sex.	Scar. Fev. before.	Dick Test.		Scarlet Antitoxin.	Dick Retest.	
				+	−		+	−
*L.R.	10	F	No	+		10 c.c. Serum No. 4 (non-conc.)	+	
*G.H.	1	F	No	+		20 ,, ,, ,,	+	
A.S.	12	F	No	+		10 ,, ,, ,,	+	
J.P.	9	M	No	+		10 ,, ,, ,,	+	

Two of these (*) contracted Scarlet Fever after the injection of this non-concentrated Serum.

As contrasted with this result, Table XI. refers to an experience in the same hospital, in the medical wards of which there had also developed a case of scarlet fever. In this case, the Dick-positive contacts each received 10 c.c. or more of a non-concentrated antistreptococcic serum (No. 4), and the table shows that even 20 c.c. of this serum failed to convert the Dick-positive reactors to Dick-negative reactors, and the absence of protective antibodies was indicated by the fact that two of the contacts developed scarlet fever.

Similarly, scarlet fever developed in the reception ward at the City Hospital, and seven susceptible contacts, Dick-positive reactors, were immunised with unconcentrated antistreptococcic serum (No. 5). Reference to Table XII. shows that the dose of serum given to 7 children varied from 10 c.c. to 30 c.c. Nevertheless, a brother and sister who received intramuscularly 10 c.c. of serum both developed scarlet fever three days later.

Table XII.

Passive Immunisation of Scarlet Fever Contacts in Pneumonia Ward.

Name.	Age.	Sex.	Dick Test.		Serum.	Results.
			+	−		
M.M.	6	F	+		15 c.c. Serum No. 5	—
J.T.	8	M	+		20 ,, ,, ,,	—
G.I.	4	M	+		25 ,, ,, ,,	—
A.F.	9	F	+		30 ,, ,, ,,	—
M.W.	12	F	+		20 ,, ,, ,,	—
M.M.	8	F	+		10 ,, ,, ,,	Contracted Scarlet Fever
J.M.	5	M	+		10 ,, ,, ,,	Contracted Scarlet Fever

It might be argued that these prophylactic measures failed because the brother and sister who had received 10 c.c. of serum were already in the prodromal period, but further experience has indicated that a potent serum may cut short the disease, not only in the period of incubation, but during the period of onset.

These isolated results are submitted as examples of the efficacy of a potent scarlatinal antistreptococcus serum as an efficient prophylactic when given in sufficient amount, and experience has shown that 5 c.c. of certain concentrated scarlatinal antistreptococcic sera are an efficient prophylactic. It only remains to be said that, with the serum therapy and prevention of scarlet fever in its present experimental

position, it would be unfair to publish results contrasting one serum with another, but the experience has been frequently repeated in the City Hospital wards, since the above results were recorded, that the administration of 5 c.c. of the concentrated antistreptococcic serum to susceptible contacts entirely prevents the spread of the disease. From the administrative point of view, it will be readily recognised that it is extremely awkward to give a serum for the purposes of passive protection and to find that the serum fails to do its work.

Passive Immunisation of Diphtheria Contacts.—The subject of the passive immunisation of diphtheria contacts need not be elaborated since such passive immunisation of susceptible contacts, whether in institutions or at home, has been established as a routine procedure in Aberdeen. The extended period that is required for an active immunity to diphtheria to develop wholly justifies the immediate production of passive immunity, and steps can be taken to induce active immunity after the diphtheria antitoxin has been eliminated from the body. All diphtheria contacts should be immediately Schick-tested, the positive reactors receiving a passive protection of 2,000 units of diphtheria antitoxin.

Serum Treatment of Scarlet Fever and Diphtheria.

The serum treatment of diphtheria is the classical example of the efficacy of serum therapy, and in proceeding to discuss the value of the serum treatment of scarlet fever it is proper to pay a tribute to the epoch-making discoveries of von Behring and Kitasato, when, in 1890, they made available diphtheria antitoxin and tetanus antitoxin as specific curative and immunising agents for diphtheria and tetanus.

Serum Therapy of Scarlet Fever.—A preliminary analysis of the results of 500 cases of mildly or moderately ill cases of scarlet fever (excluding profoundly toxic and septic cases) treated with serum in the City Hospital, as contrasted with an analysis of the results of 500 cases of scarlet fever which did not receive serum, is set forth in Table XIII.

Table XIII.

Analysis of 500 Control Cases and 500 Treated with a Concentrated Antitoxic Antibacterial Serum.

	Control without Serum.		Control with Concentrated Serum.	
No. of Cases,	500		500	
Amount of Serum,	—		12·2 c.c.	
Days in Hospital,	36·7		28	
Return Cases,	21·8		10	
Acute Otitis,	10·8		3·7	
Acute Mastoiditis,	1·1		—	
Adenitis,	15·4		3·7	
Arthritis	3·0	%	0·8	%
Nephritis.	2·8		0·2	
Rhinorrhœa,	0·4		1·4	
Serum Disease,	—		23·7	
Deaths,	1·1		—	

It would appear from Table XIII. that serum treatment, particularly with a potent serum, is capable of reducing the average stay of scarlet fever patients in hospital, and of reducing the serious complications of the disease and the number of return cases. The reason for excluding the grave toxic and septic cases of scarlet fever from this preliminary comparison of serum treated cases of scarlet fever with cases that did not receive serum, is dependent on the fact that during the present epidemic prevalence of scarlet fever the disease has been of a milder description than was the case during the years 1923-24, from which the statistics of control cases (not receiving the serum treatment) are taken. It will be obvious that for purposes of a proper comparison the figures should have related to the same period, and every alternate case only should have received serum; but the efficacy of the serum in causing defervescence and subsidence of symptoms within twenty-four hours was so apparent in the early stages of the application of serum therapy that it appeared that it would not be legitimate to withhold serum treatment to the extent that such an arrangement would have implied.

Treatment of Toxic and Septic Cases of Scarlet Fever.

Prior to the recent advances in our knowledge of the part played by the *S. scarlatinæ* in the etiology of the disease, toxic cases of scarlet fever were regarded as suffering from a profound toxaemia induced by the unknown virus of the disease, whereas septic cases were regarded as milder cases of scarlet fever caused by the same unknown virus, but in which secondary streptococci gave rise to grave septic complications. Recent work on the etiology of scarlet fever, however, and in particular the serological classification of the *S. scarlatinæ* would indicate that in both toxic and septic cases of scarlet fever the *S. scarlatinæ* is the causative organism; that in toxic scarlet fever the scarlet streptococci produce toxins that are immediately absorbed and produce an overwhelming poisoning of the whole body; and that in septic scarlet fever the streptococci and their toxins produce their main damage in various local foci.

Treatment of Toxic Cases of Scarlet Fever.—Apart from the experience of the serum treatment of some 500 cases of mild or moderately ill scarlet fever as above recorded, Taylor has had experience, from September, 1925, of the treatment of eight cases of toxic scarlet fever in all. His results with these eight toxic cases have been as remarkable as, or even more remarkable than those obtained in treating ordinary cases. It is as essential, however, to give large doses of scarlatinal antistreptococcic serum in toxic cases as it is to give large doses of diphtheria antitoxin in toxic cases of diphtheria. Thus it has been found that, within twelve hours of the intravenous administration of from 50 to 100 c.c. of the concentrated antistreptococcus serum, the signs and symptoms of profound toxæmia have disappeared, consciousness is regained, the cardiac condition is much more satisfactory, the temperature falls practically to normal, and meningeal symptoms which are frequently present in such cases largely subside. In short, the prognosis in toxic cases of scarlet fever changes in the majority of cases from grave to hopeful after serum treatment.

Of the eight typical cases of toxic scarlet fever thus receiving serum treatment, five recovered and three died. So far as it goes, this is a remarkable result, since in toxic scarlet fever, in pre-antitoxin days, the case-mortality was commonly 90 per cent. or more. This experience with eight toxic cases, though limited, has profoundly impressed us with the importance of the early exhibition of serum treatment in such toxic cases. Thus, in the three cases that died, serum treatment was not administered until the third to the fifth day of illness, whereas, in the five cases that recovered, serum was given within the first forty-eight hours. The following description of one of these toxic cases receiving serum treatment is submitted as a type:—

J. G., 14½ years, was admitted on 15th March, 1926, with a temperature 103°, a pulse 120, unconscious, and in an extremely toxic condition. Excision of the neck glands had been performed four days previously in the Aberdeen Royal Infirmary, and two days later scarlet fever developed. On examination, the pupils were equal, and reacted to light, the head was retracted, the neck rigid, and abdominal reflexes present, the knee jerks absent, both plantars extensor and both Kernig's positive. The tongue was coated with a white fur, the throat much congested, the tonsils enlarged, and there was much muco-pus on the pharyngeal wall. There was no evidence of a rash, the blood culture was sterile, the fæces contained no pathogenic organisms, the cerebro-spinal fluid was normal. 100 c.c. of concentrated antistreptococcus serum was administered intravenously, and in 12 hours the temperature and pulse were normal and consciousness re-established. Twelve days after admission desquamation commenced, and convalescence was uninterrupted.

Treatment of Septic Cases of Scarlet Fever.—Taylor's experience has been limited to twelve cases, but, in these, much benefit was derived from this specific therapy, provided the serum was given in large amounts within forty-eight hours of the onset of the illness. This limited experience, however, indicates that, if serum treatment is not applied until after the first two days of illness, the septic complications of the disease appear to manifest themselves independent of the amount of serum administered. In other words, once what are known clinically as the septic complications of scarlet fever have manifested themselves, serum therapy has but little or no effect upon their progress. The following description of one of these twelve septic cases is submitted as a type:—

G. T., aged 5 years, was admitted on the sixth day of illness suffering from septic scarlet fever. The rash was typically blotchy and widespread. The tongue had peeled, was red and raw, with the papillæ much enlarged. The fauces, tonsils, and palate were much congested, and the pharyngeal wall, pillars, and peritonsillar tissues were covered with slimy exudate and showed evidence of ulceration. The glands on both sides of the neck were greatly enlarged, especially on the right side, and there was profuse purulent nasal discharge. The temperature was 101·6° F., the pulse rate 150, and the respiratory rate 28. 70 c.c. of scarlatinal antistreptococcus serum was administered intravenously, and in 12 hours the general condition had greatly improved, although there was no change in the temperature and pulse. Two days after admission he developed a right acute otitis media, 9 days later a left otitis media, and 16 days after admission he developed an acute nephritis. On the 21st day the glandular enlargement on the left side of the neck was marked, and on incising, 4 ozs. of pus was evacuated. During this whole period the temperature was never below 99·4° F., and the pulse rate was continuously in the region of 130. Recovery was long delayed. There is, however, no doubt that without the exhibition of the potent antistreptococcus serum, this boy would have died.

Limited as our experience has been of the value of antitoxic serum in the treatment of scarlet fever, we are nevertheless satisfied that further experience will entirely justify our view that in scarlatinal antistreptococcus serum there has been made available for scarlet fever a specific therapy of the highest order.

Serum Treatment of Diphtheria.

It will be obvious that there is no occasion to submit a statement descriptive of the efficacy of diphtheria antitoxin in the treatment of diphtheria. Recent contributions to our knowledge of the serum therapy of diphtheria have been reviewed afresh in Chapter 7 of the *Medical Research Council Monograph*. In summing up, the writers of the Monograph express their opinion that there is sufficient evidence of first-rate value, backed up by a mass of statistics of secondary importance and by a great body of professional opinion, to show that antitoxin treatment is of the utmost value in human diphtheria. Consequently the writers of the Monograph hold that all cases of diphtheria, save perhaps the mildest, should be given the benefit of the earliest and the fullest antitoxin treatment. From the clinical point of view, we would endorse and emphasise this opinion. To the clinician, the serum therapy of diphtheria, by the precedence of its discovery, stands out as the greatest triumph of specific therapy.

SUMMARY.

Evidence is submitted which goes to prove that the newer knowledge of diphtheria and scarlet fever when made applicable to hospital practice and to community immunisation has provided a fresh prospect of the comprehensive control of both scarlet fever and diphtheria.

Etiology of Scarlet Fever.

The accumulating evidence that the *S. scarlatinæ* is the actual cause of scarlet fever receives support from the fact that hæmolytic streptococci have been isolated from the throat brushings of practically all cases of scarlet fever patients admitted in the acute stage of the illness to the City Fever Hospital. By means of agglutination and absorption tests it has been shown that the strains of *S. hæmolyticus* can be divided into various groups. It has been found that the same type of streptococcus can on occasion originate at least five separate clinically distinguishable diseases, namely, scarlet fever, tonsilitis, erysipelas, puerperal fever, and bronchopneumonia. This is a new epidemiological conception, and it would appear that so far as streptococcal infections are concerned, the nature of the disease entity is determined by the toxigenic qualities of the type of streptococcus, by the susceptibility or insusceptibility of the individual as determined by the absence or presence of the specific antibodies in the blood, and by the site of the infection itself. These findings throw light on the nature of the immunity induced by injections of scarlatinal streptococcus toxin, and on the increased incidence of streptococcic tonsilitis that has been found to occur in nurses immunised against scarlet fever.

Schultz-Charlton Reaction.

A positive Schultz-Charlton reaction has been obtained in 89·6 per cent. of 135 patients who in their clinical appearances were undoubted cases of scarlet fever. A positive Schultz-Charlton reaction together with a positive Dick reaction affords valuable confirmatory evidence of a diagnosis of scarlet fever.

Dick Test of Susceptibility to Scarlet Fever.

It has been found that 86·3 per cent. of 170 patients suffering from scarlet fever give Dick-positive reactions in the first two days of illness, and that by the fourth week of illness the number of positive reactors had declined to 22, or 14 per cent.

Of 267 normal individuals who gave no history of scarlet fever, it was found that in the age-period under 6 months only 20 per cent. gave a positive reaction; from 6 months to 5 years, 77 per cent. gave a positive reaction; in the 6-10 year period, 46 per cent.; in the 10-20 year period, 38 per cent.; and the group 20 years and upwards, 27 per cent.

Of 60 individuals who gave a definite history of having had scarlet fever, 9 individuals, or 15 per cent., gave a positive Dick reaction.

Of 1,500 individuals of random distribution, 96·4 per cent. gave a positive Dick reaction in the 6 months-5 years age-period; 81·2 per cent. in the 5-10 year period; 65·5 per cent. in the 10-15 year period; 60·8 per cent. in the 15-20 year period; 52·4 per cent. in the 20-25 year period; and 27·2 per cent. in the period 25 years and over.

Of 718 west-end school children, 78·3 per cent. were found Dick-positive; of 392 middle class school children, 59·0 per cent. were found Dick-positive; while of 404 east-end school children, 29·2 per cent. were Dick-positive.

Further evidence of the value of the Dick test as a guide to the susceptibility of individuals to scarlet fever has been obtained by testing the nurses and patients in wards in which cross infection with scarlet fever had taken place. Thus, scarlet fever has been observed to occur in 21 patients who had previously shown a positive Dick reaction. Numerous Dick-negative reactors admitted to scarlet fever wards with no definite clinical signs of the disease were allowed to remain in contact with scarlet fever cases, and in none of these cases did scarlet fever develop. It has been observed that the intensity of the Dick reaction is of much significance, and in the present investigation scarlet fever has only been found to occur in individuals giving a marked Dick-positive reaction. It is thus probable that numerous individuals regarded at present as susceptible will later be eliminated when further investigation has been made of the immunity mechanism in scarlet fever and when a method of more accurate standardisation of the toxin has been evolved.

Schick Test of Susceptibility to Diphtheria.

Of 1,500 individuals of random distribution Schick-tested, 94·0 per cent. gave a positive Schick reaction in the 6 months-5 year period; 80 per cent. gave a positive reaction in the 5-10 year period; 67·9 per cent. gave a positive reaction in the 10-15 year period; 64·5 per cent. in the 15-20 year period; and 54·2 per cent. in the 20-25 year period.

Of 708 west-end school children, 78·5 per cent. were found Schick-positive; of 376 middle class school children, 62·5 per cent. were found Schick-positive; while of 404 east-end school children, 31·2 per cent. were Schick-positive.

Of 105 persons who had previously suffered from diphtheria, 43, or 41·0 per cent., were found to be Schick-positive.

Evidence of the value of the Schick test as a guide to the susceptibility of individuals to diphtheria has been obtained by testing the nurses and patients in wards in which cross infection with diphtheria has taken place. Thus all patients on admission to scarlet fever wards are immediately Schick-tested, and the experience has been that Schick-negative reactors can be left in contact with actual cases of diphtheria without contracting the disease.

Prevention of Scarlet Fever by Active Immunisation.

Since 1st June, 1925, the nursing and domestic staff of the City Hospital have been actively protected against scarlet fever before being admitted for duty to the scarlet fever wards. Of 122 nurses and 29 maids who were Dick-tested, 29 nurses and 7 maids were found to be Dick-positive and were immunised by one or more series of injections of scarlatinal streptococcus toxin. Prior to the institution of active immunisation of the nursing staff, an average of 9·5 per cent. of the staff suffered annually from scarlet fever, and since 1st June, 1925, no cases of scarlet fever have occurred in the staff, although the disease had assumed epidemic prevalence in the town during that time, and two wards in the City Hospital have been continuously occupied by scarlet fever patients. (See Chart No. 1, p. 16.)

It has been found that co-incident with the disappearance of scarlet fever in the immunised nursing staff of the City Hospital there has been a notable increase in the incidence of streptococcic tonsilitis in these immunised nurses. The streptococci obtained from these cases of tonsilitis in immunised nurses commonly fall into one or other of the serological groups of scarlatinal streptococci, and it would appear, therefore, to be proved that the immunised nurses, while protected by immunisation from the toxic effects of the exotoxin of *S. scarlatinæ*, are in no wise protected against tonsilitis due to the *S. scarlatinæ*.

Of 393 school children who received a first series of immunising injections of scarlatinal prophylactic, 257 were retested within four months of receiving the injections, and of these 194, or 75·6 per cent., were found protected as indicated by a negative Dick reaction. None of the 194 protected children subsequently contracted scarlet fever, although the disease has been rife in the schools. One child, two months after having received a first series of injections, not having been retested in the interim, developed scarlet fever.

Prevention of Return Cases of Scarlet Fever.

It has been shown that return cases of scarlet fever can be prevented by Dick-testing all the contacts in the home of the patient immediately the patient has been admitted to hospital and thereafter immunising the Dick-positive reactors. The first immunising injection of 500 skin doses of scarlatinal streptococcus toxin is given on the day the positive Dick reaction is read, five days later a second injection of

1,000 skin doses of toxin is given, and five days later a third injection of 3,000 skin doses; and within fourteen days of the third injection (that is, twenty-four days after the case of scarlet fever has been removed to hospital) these susceptible contacts are found to be immune as judged by a negative Dick reaction. Accordingly when the scarlet fever patient is discharged from hospital he returns home to a family, the susceptible members of which have all been immunised against scarlet fever. Up to the date of reporting, 252 families have been tested and immunised in this way under the supervision of the Health Department, and it is interesting to note that only one return case of scarlet fever has occurred in any of the 252 families.

Control of Epidemic Prevalence of Scarlet Fever by Active Immunisation.

It has been found that about 95 per cent. of Dick-positive reactors become Dick-negative about a fortnight after the third immunising injection. Therefore, the immunity to scarlet fever induced by streptococcus toxin develops much more rapidly than that to diphtheria induced by diphtheria toxoid-antitoxin injections, which take from six weeks to six months to develop. Even although some 25 per cent. of these Dick-negative reactors again become Dick-positive within four months, nevertheless the degree of immunity conferred is of a high order while it endures, and with this prophylactic device being made widely available in the presence of an epidemic of scarlet fever there is a good prospect of promptly checking the epidemic prevalence of the disease, as contrasted with the known failure of diphtheria toxoid-antitoxin injections to control epidemics of diphtheria immediately.

The Exotoxin of S. Scarlatinæ and its Detorification.

The exotoxin of *S. scarlatinæ* used in this investigation has been obtained by growing a strain thereof in Hartley's Trypsin broth for twenty-four hours, and the germ-free soluble exotoxin has been standardised by comparing the reactions produced by various dilutions of the new toxin with the reaction produced by the diluted standard toxin on normal children, on acute cases and on convalescent cases of scarlet fever. The actual Dick-test dose varied between 0·2 c.c. of 1 in 1,000 dilution of one toxin to 0·2 c.c. of a 1 in 2,000 dilution of another. Graduated doses containing 500, 1,000, and 3,000 such skin test doses have been used for producing active immunity. This scarlet fever toxin in the doses indicated produces in about 3 per cent. of susceptible individuals marked local and general disturbances. Within twenty-four hours of injection local redness with swelling of the arm appears, while in very markedly susceptible individuals general symptoms may develop within a few hours. In exceptionally susceptible individuals it has been repeatedly found that the whole clinical picture of scarlet fever, going on to marked desquamation, is produced by the subcutaneous injection of the exotoxin derived from the *S. scarlatinæ*. It is obvious, therefore, that the whole symptomatology of scarlet fever is due to the action of the exotoxin of *S. scarlatinæ*. That this is so, and that the symptoms are not produced by a filterable living virus which might be associated with the filtered exotoxin is proved by the fact that the filtrate containing the exotoxin is still capable of producing the whole symptomatology of scarlet fever in

susceptible individuals after the filtrate has been heated to 55° C. for one hour. It has further been shown that in producing active immunity by doses of *S. scarlatinæ* toxin the immunity conferred prevents only the effects produced by the exotoxin alone and has no effect in preventing infection by the scarlatinal streptococcus.

The provision of a detoxified scarlatinal streptococcus toxin or toxoid which can be used with safety and which produces a high immunisation response is the most urgent requirement of the present community immunising campaign. Accordingly attention has been concentrated by one of us (Smith) on making available a streptococcus anatoxin by modifying the toxin by treatment with formalin. Greater difficulty has been experienced in converting scarlatinal toxin into toxoid than with diphtheria toxin, but a potent non-irritant antitoxin which, it is believed, will profoundly facilitate the immunising campaign against scarlet fever has been prepared.

Similarly, experiments on the detoxification of streptococcus toxin by sodium ricinoleate have been undertaken, and it has been found that a single injection of 4,000 skin doses of the soap toxin mixture produces a high immunity response, as judged by the Dick test. We have not felt justified in making any extended application of the scarlatinal toxin modified by sodium ricinoleate for purposes of immunisation, since experiments on laboratory animals with streptococcus toxin detoxified with sodium ricinoleate have seemed to justify the view that the ricinoleate absorbs the toxin only temporarily, and that the whole of the toxin may in certain circumstances be abruptly released.

Prevention of Diphtheria by Active Immunisation.

Since 1st January, 1922, the nursing and domestic staff of the City Hospital have been actively protected against diphtheria before being admitted for duty to the diphtheria wards. Of 125 nurses and 30 maids who were Schick-tested, 50 nurses and 11 maids were found to be Schick-positive, and were immunised by one or more series of injections of diphtheria toxoid-antitoxin. Prior to the institution of active immunisation of the nursing staff, an average of 11 per cent. of the staff suffered annually from diphtheria, and since 1922 an average of 1·6 per cent. The incidence of diphtheria in the staff has been reduced from 18·4 per cent. in 1921 to 0 – 3·2 per cent. in the years 1922-25. (See Chart No. 2, p. 24.)

Of 734 school children who received a first series of immunising injections of diphtheria prophylactic, 201 were retested at the end of six months, and of these, 164, or 81·6 per cent., were found to be protected, as indicated by a negative Schick reaction. None of these 164 protected children has contracted diphtheria, although 3 of the children who had received a first series of injections and who had not yet been retested developed diphtheria within five months of receiving the injections.

Prevention of Return Cases of Diphtheria and Control of Epidemic Prevalence.

Active immunity to diphtheria induced by injections of toxoid-antitoxin takes from six weeks to six months to develop, and, accordingly, this protective device is of no use in preventing return cases of diphtheria. For this purpose, Schick-testing and passive immunisation of Schick-positive reactors with diphtheria antitoxin remains the only effective procedure.

Concurrent Active Immunisation against Diphtheria and Scarlet Fever.

This investigation has shown that a combined prophylactic composed of diphtheria toxoid-antitoxin and scarlatinal streptococcus toxin can be used with safety and gives a satisfactory immunisation response. The experimental work on laboratory animals with the combined prophylactic carried out by Smith and O'Brien warranted its application to man. For the initial experiments, volunteer medical students and nurses who had been found to be both Schick-positive and Dick-positive reactors were available. It was found that a satisfactory immunity, as indicated by the conversion of the Schick-positive and Dick-positive reactions to negative reactions, was developed by the injections of the combined prophylactic, and further confirmation of these results was obtained by fully testing out the combined prophylactic on children under six years of age admitted to the tuberculosis and marasmus wards of the City Hospital. It was thus possible to give an assurance that the combined prophylactic could apparently be used with as much safety as could the diphtheria prophylactic and scarlatinal prophylactic when used separately.

Use of Combined Diphtheria and Scarlet Fever Prophylactic in Community Immunisation.

An abundance of experimental data goes to show that from 80 to 90 per cent. of children under 6 years of age are susceptible both to diphtheria and scarlet fever, as shown by positive Schick and Dick tests; and accordingly no preliminary Schick-testing or Dick-testing is required in children under this age-period, and the injections of the combined prophylactic can be straightway administered. Up to the end of September, 1926, 524 children in the 1 year to 6 years age-period have received a first series of immunising injections of the combined prophylactic. This experience of the immunisation of infants and children attending the Child Welfare Centres has emphasised the urgency of the need for securing an immunising mixture which will provide protection against scarlet fever and diphtheria with the smallest possible number of injections. Even when the preliminary susceptibility tests are eliminated, it is found in practice that mothers are reluctant to have their infants re-tested after the first series of immunising injections, and for this reason and in order to encourage the widest number of parents to secure this immunising device for their children, it has been considered advisable to delay the re-testing of these children until they enter school at the 5-6 year age-period.

School children are more sensitive to the injection of the combined prophylactic than are children in the 0-6 year age-period, and in school children preliminary Schick and Dick testings are indicated. A total of 1,305 school children, who were found to be Dick-positive and Schick-positive reactors, received a first series of immunising injections of the combined diphtheria and scarlatina prophylactic. Of these 1,305 children, 151 were retested at the end of three months, with the following results:—

121 of the 151 children, or 80 per cent., were found to be Dick-negative;
16, or 11 per cent., were found to be mildly Dick-positive; and
14, or 9 per cent., were found to be markedly Dick-positive.

Some 82, or 54 per cent., were found to be Schick-negative;
38, or 25 per cent., mildly Schick-positive; and
31, or 21 per cent., markedly Schick-positive.

Six of the children who had received a first series of immunising injections of the combined prophylactic and who had not been re-tested developed scarlet fever—1, two months later; 2, four months later; 2, six months later; and 1, eleven months later. Two developed diphtheria—1, three months later; and 1, eleven months later.

Passive Immunisation of Scarlet Fever Contacts.

The problem of controlling the spread of scarlet fever among scarlet fever contacts is more difficult than the control of diphtheria among diphtheria contacts, since no bacteriological tests are available which can differentiate the *S. scarlatinæ* from other toxin-producing hæmolytic streptococci. In the absence of a bacteriological test for *S. scarlatinæ*, the ideal method of dealing with scarlet fever contacts would be to immediately immunise passively all positive reactors and to proceed a month later to produce an active immunity with streptococcus toxin. The increase in the number of injections and the length of time over which such injections have to be made, make contacts reluctant to secure such comprehensive protection.

Having in view the mild type of scarlet fever which at present prevails, the practice in Aberdeen is to allow contacts to take their chance of an immediate infection and to urge the desirability of securing an enduring active protection which can be developed in twenty-four days' time. This applies to the limited number of contacts which occur in any private house. In the event of an outbreak of scarlet fever in an institution, however, or in the event of the cross infection of a diphtheria ward with scarlet fever, the withholding of a passively immunising injection from the contacts who are positive reactors cannot be justified. On the contrary, evidence is submitted which goes to prove that if the prophylactic dose of the antistreptococcus serum has been accurately determined and administered, then this passively immunising serum provides a certain method of controlling the infection.

Passive Immunisation of Diphtheria Contacts.

Passive immunisation of susceptible contacts, whether in institutions or at home, has been established as a routine procedure in Aberdeen. The extended period that is required for active immunity to diphtheria to develop as a result of diphtheria toxoid-antitoxin injections wholly justifies the immediate production of passive immunity in Schick-positive reactors by means of diphtheria antitoxin, and steps can be taken to induce active immunity a month later, when the antitoxin has been eliminated from the body.

Serum Therapy of Scarlet Fever.

Evidence is submitted which goes to show that concentrated antistreptococcus serum, 1 c.c. of which contains from 300 to 600 streptococcus antitoxin units, is a specific remedy for scarlet fever of great value. Suitable doses of the antistreptococcus serum have varied from 10 c.c. to 100 c.c. according to the toxicity of

the case. Serum treatment has an immediate effect in reducing temperature and alleviating other symptoms. It is capable of reducing the serious complications of the disease, the number of return cases, and the average stay of scarlet fever patients in hospital. The benefit derived by toxic and septic cases of scarlet fever from serum therapy is even more evident. Admirable results are obtained in all cases if the serum is administered within 48 hours of the onset of the illness. Once the septic or other complications of scarlet fever have manifested themselves, serum therapy has but little or no effect in determining their progress.

Conclusions.

1. From the evidence submitted it appears reasonable to conclude that the comprehensive control of the incidence of scarlet fever and diphtheria in the community will be obtained when the newer methods of immunising against these diseases have been generally adopted.
2. Scarlatinal streptococci obtained from the throats of cases of scarlet fever can be divided into various groups by means of agglutination and absorption tests. The same type of streptococcus can on occasion originate at least five separate clinically distinguishable diseases, namely, scarlet fever, tonsilitis, erysipelas, puerperal fever, and broncho-pneumonia, and it would appear that, so far as streptococcic infections are concerned, the nature of the disease entity is determined by the toxigenic qualities of the type of streptococcus, by the susceptibility or insusceptibility of the individual as determined by the absence or presence of the specific antibodies in the blood, and by the site of the infection itself.
3. Strong corroboration for the view that the *S. scarlatinæ* is the causal organism of scarlet fever is obtained from the following findings, viz.:—
   (*a*) *S. scarlatinæ* have been isolated from the throat brushings of practically all acutely ill scarlet fever patients;
   (*b*) The whole clinical picture of scarlet fever going on to marked desquamation is produced by the subcutaneous injection of the exotoxin derived from the *S. scarlatinæ*, the exotoxin having been heated to 55° C. for one hour, with a view to destroying any filterable living virus which might be associated with the filtered exotoxin;
   (*c*) In the Schultz-Charlton reaction the blanching of the scarlet fever rash is caused by the serum of a horse immunised against *S. scarlatinæ* and its toxins;
   (*d*) Dick-positive and Dick-negative reactions as produced by the intradermal injection of the streptococcus toxin have the closest correspondence to the degree of susceptibility or immunity to scarlet fever of the respective reactors;
   (*e*) Susceptible nurses once they are actively immunised by injections of scarlatinal streptococcus toxin have been shown to be immune to the toxin of scarlet fever, and susceptible school children similarly inoculated are likewise immune;

(*f*) Return cases of scarlet fever can be prevented by actively immunising susceptible contacts with scarlatinal streptococcus toxin prior to the scarlet fever patient being discharged from hospital; and

(*g*) Susceptible contacts can be safeguarded from taking scarlet fever by passively immunising them with a sufficient dose of antistreptococcus serum obtained from a horse which has been immunised by injections of *S. scarlatinæ* and its toxin.

4. The limitations of the Schultz-Charlton reaction as an aid in the diagnosis of scarlet fever have been confirmed.
5. Evidence has been obtained which firmly establishes the value of the Dick susceptibility test as a measure of susceptibility to scarlet fever.
6. Extensive corroboration of the value of the Schick test as a measure of susceptibility to diphtheria has been obtained.
7. The efficacy of active immunisation against scarlet fever by means of scarlatinal streptococcus toxin injections has been demonstrated by the fact that, while scarlet fever has been present in epidemic form in Aberdeen, no nurses or maids in Aberdeen City Hospital have contracted scarlet fever since 1st June, 1925, from which date the nursing and domestic staffs of the Hospital have been actively immunised before being admitted for duty to the scarlet fever wards; whereas, prior to that date, an average of 8·5 nurses, or 9·5 per cent. of the nursing staff, and 1·4 maids, or 4·2 per cent. of the domestic staff, annually suffered from scarlet fever.
8. Coincident with the disappearance of scarlet fever in the immunised nursing staff of the City Hospital, there has been a notable increase in the incidence of streptococcic tonsilitis in these immunised nurses, and the streptococci obtained from these cases of tonsilitis in nurses commonly fall into one or other of the serological groups of scarlatinal streptococci; and accordingly it would appear to be proved that immunised nurses, while protected by immunisation from the toxic effects of the exotoxin of *S. scarlatinæ*, are not protected against tonsilitis due to *S. scarlatinæ*.
9. It has been demonstrated for the first time that return cases of scarlet fever can be prevented by Dick-testing all the inmates of the house from which a scarlet fever patient has been removed to hospital and thereafter immunising the Dick-positive reactors—the three injections of streptococcus toxin in 500, 1,000 and 3,000 skin doses respectively being given at intervals of 5 days, and resulting in an active immunity as judged by a negative Dick reaction being developed 14 days after the third injection (that is, 24 days after the case of scarlet fever has been removed to hospital). Accordingly, when the scarlet fever patient is discharged from hospital, he returns home to a family, the susceptible members of which have all been immunised against scarlet fever.
10. The finding that immunity to scarlet fever develops 14 days after the third immunising injection has been corroborated, and accordingly reason is given for the belief that this actively immunising device will prove of great value in the early control of scarlet fever during its epidemic prevalence.

11. The urgency of the need for the provision of a detoxified scarlatinal streptococcus toxin or toxoid has been indicated, and a potent non-irritant streptococcus anatoxin has been prepared, which it is believed will profoundly facilitate the immunising campaign against scarlet fever.

12. The efficacy of active immunisation against diphtheria by means of diphtheria toxoid-antitoxin injections has been demonstrated by the fact that since 1st January, 1922, the incidence of diphtheria in nurses and maids in Aberdeen City Hospital has been reduced from an annual average of 11 per cent. of the staff prior to 1922 to an average of 1·6 per cent. during the years 1922-1925.

13. It has been shown that return cases of diphtheria cannot be prevented, nor can the epidemic prevalence of diphtheria be immediately controlled by means of diphtheria toxoid-antitoxin injections, since this active immunity takes from six weeks to six months to develop. Schick-testing and passive immunisation of the positive reactors with diphtheria antitoxin remains the only effective procedure for the prevention of return cases of diphtheria and the immediate control of the epidemic prevalence of the disease.

14. It has been demonstrated for the first time that diphtheria toxoid-antitoxin can be used in admixture with scarlatinal streptococcus toxin as a combined diphtheria and scarlatina prophylactic. The experiments have proved that the combined prophylactic can be used with as much safety as can the diphtheria prophylactic and scarlatina prophylactic used separately. In testing out the immunising action of the combined prophylactic in about 2,000 children, it has been shown that the immunisation response is of a high order.

15. It has been demonstrated that 5 c.c. of a potent scarlatinal antistreptococcic serum, containing 500 antitoxin units per c.c., invariably produces a satisfactory passive immunity in susceptible scarlet fever contacts and prevents them contracting the disease. In view of the fact that an active immunity to scarlet fever can be induced within 24 days, it has not been considered necessary to make this passively immunising device available for scarlet fever contacts in private houses as a routine, such contacts being allowed to take their chance of an immediate infection and being urged to secure an enduring active immunity. In the event of an outbreak of scarlet fever in an institution, however, or in the event of the cross infection of a diphtheria ward with scarlet fever, the withholding of a passively immunising injection from the contacts who are positive reactors cannot be justified. On the contrary, the evidence submitted goes to prove that, if the dose of antistreptococcus serum is sufficient, then the passive immunity induced by it is a certain method of controlling the infection.

16. Passive immunisation of susceptible diphtheria contacts, whether in institutions or at home, by means of 2,000 units of diphtheria antitoxin, is the only method of immediately controlling the disease owing to the extended period that is required for the production of an active immunity. The active immunity can

be induced a month later, when the diphtheria antitoxin has been eliminated from the body.

17. Evidence is submitted which goes to show that a potent antistreptococcus serum, 1 c.c. of which contains 500 streptococcus antitoxin units, is a specific therapy for scarlet fever of a high order. Suitable doses of the antistreptococcus serum vary from 10 c.c. to 100 c.c. according to the toxicity of the case. The serum has an immediate effect in reducing temperature and alleviating other symptoms, and is capable of reducing the serious complications of the disease, the number of return cases, and the average stay of scarlet fever patients in hospital. The benefit derived by toxic and septic cases of scarlet fever is even more evident. Admirable results are obtained in all cases if the serum is administered within 48 hours of the onset of illness. Once septic complications of scarlet fever have manifested themselves, serum therapy has but little or no effect in determining their progress.

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II.—THE PHOTOMETRY OF THERAPEUTIC LAMPS.

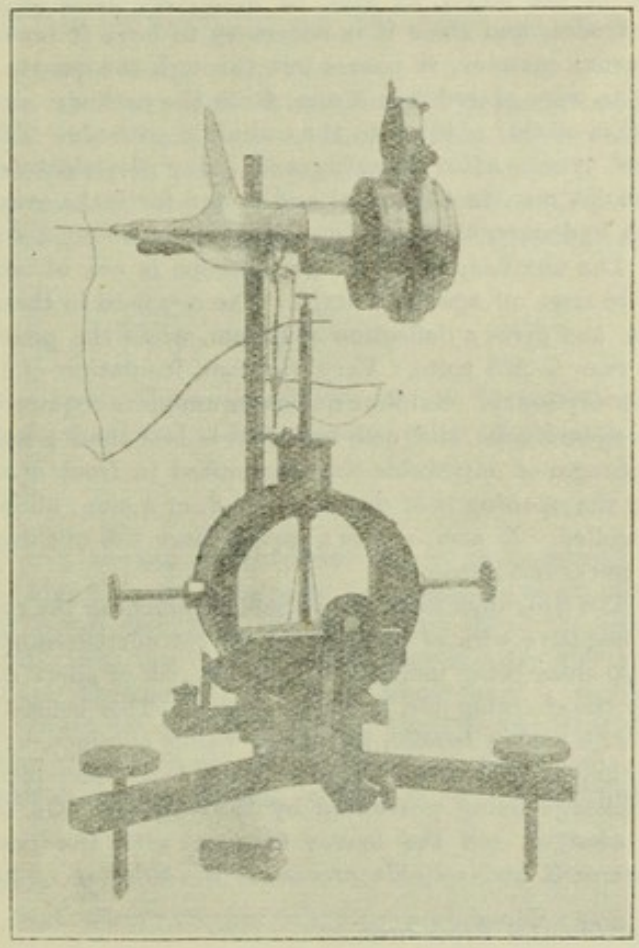
In the preceding Annual Report of the Medical Officer of Health, reference was made to the desirability of devising a photo-electric cell that could be used for the measurement of ultra-violet rays, and the following extracts from the papers of Messrs. Griffith and Taylor, as appearing in the *Lancet* (5th December, 1925, p. 1,205) and *Journal of Hygiene* (Vol. XXV., No. 2, 14th July, 1926) show how this has been accomplished by collaboration between the Natural Philosophy Department of the University of Aberdeen and the Health Department of the City of Aberdeen.

THE PHOTOMETRY OF THERAPEUTIC LAMPS.

A.—An Instrument for Measuring Ultra-Violet Radiation, and Some Applications of Therapeutic Interest.

The instrument and methods herein described have been developed in order to provide a straightforward means of comparing the intensity of the ultra-violet radiation of lamps used for purposes of artificial sunlight treatment. Somewhat similar instruments have been devised by other investigators*† for meteorological purposes, but the technique given below is believed to be especially suitable for measuring the radiation of therapeutic lamps.

The essential principle of the method is the photo-electric effect discovered by Hertz and Hallwachs, on which a great body of physical research has subsequently been done. The results which emerge are that a metal plate, when illuminated by radiation of wave-length less than a certain critical value, emits electrons, so that if the metal be given a negative charge before illumination this charge is gradually lost during illumination. The "threshold" wave-length depends on the particular metal concerned. The loss of charge can be detected conveniently by means of a gold-leaf electroscope with its leaf connected to the metal plate. If the electroscope and the plate are charged to a negative pressure of, say, 200 volts, relative to the earth, the leaf will diverge. Then on illumination with light of any wave-length less than the threshold wave-length for the metal of the plate, the divergence gradually decreases till all the charge has leaked away. The rate at which the leaf falls is controlled by the rate at which leakage of electricity takes place from the illuminated plate, and this is dependent on the intensity of illumination. Detection of the small leakage current is also possible by means of a galvanometer, but this method is less convenient.

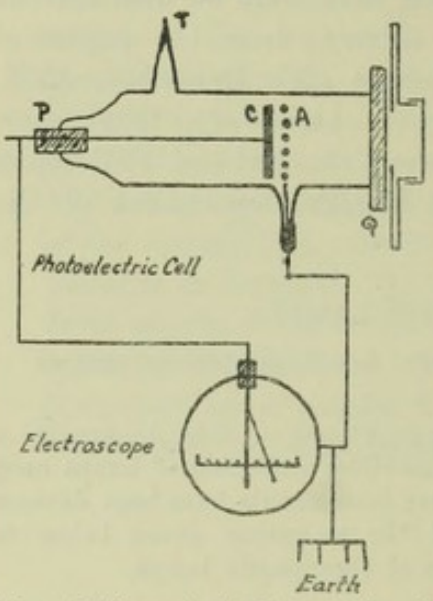


General view of Instrument for measuring Ultra-violet Radiation.

* Elsterand Geitel, Physikolische Zeitschrift, 1914, xv. 1; 1915, xvi., 405.
† Dorno: Ibid., 1917, xviii., 381.

The results obtained tend to be variable unless the active plate (cathode) is protected from chemical change such as oxidation, and it is desirable therefore to enclose the plate in a vessel either evacuated or filled with some indifferent gas, preferably at reduced pressure. A second earthed electrode acting as an anode is provided to give the ejected electrons a definite route out of the cell.

FIG. 2.

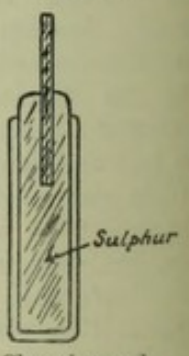


In the application of these facts to the work under consideration, advantage is taken of the photo-electric properties of cadmium, which is insensitive to radiation of wave-length greater than 350 $\mu\mu$, and of the fact that quartz absorbs waves shorter than about 200 $\mu\mu$. A photo-electric cell with a cadmium cathode is employed, the cathode being illuminated through a quartz window. In this way a device is obtained actuated only by radiation of wave-length between 350 $\mu\mu$ and 200 $\mu\mu$—that is, by the region of the spectrum comprising those radiations which are of greatest biological interest. (Figs. 1 and 2.)

The electrodes of the photo-electric cell are mounted in a gas-tight manner in a glass vessel closed at one end with a flat quartz plate Q, through which the active radiation enters the instrument. The cadmium electrode C takes the form of a thin disc of the metal, 22 mm. in diameter, fixed to a copper support. This forms one of the electrodes, and since it is necessary to have it insulated from the glass of the cell in the most rigorous manner, it passes out through the quartz bush P. The anode A is a wide-mesh grid of fine wire placed 2 or 3 mm. from the cathode, and the incident radiation shines through the meshes of this grid on to the cadmium cathode. The seals are made with vacuum waxes of the usual type. After cleaning and fixing the electrodes the cell is evacuated as far as possible (to 0·001 mm. in this case) and tested for leaks over a period of several days. It is then filled with hydrogen or argon to a pressure of about 3 mm. mercury and sealed off at T.

The auxiliary gold-leaf electroscope is one of ordinary type in which the position of the leaf can be read off against a scale. The one used in these experiments has leaves 5 cm. long by 2 mm. wide and gives a deflection of 12 mm. when the pressure between the leaf and the case is 220 volts. Very rigorous insulation of the support of the leaf is again necessary. Sulphur quartz or amber is required. The "natural leak" of the electroscope and cell together is less than 1 scale division per hour. A diaphragm of adjustable size is mounted in front of the cell and can be set so that the opening is of diameter 16, 8, or 4 mm., allowing the sensitivity to be controlled. It also carries a cap to cover the opening of the diaphragm when the cell is not in use.

FIG. 3.



Charging rod.

The instrument can be charged by touching the rod of the electroscope with the negative wire of the 220-volt direct current-supply, a safety resistance of 50,000 ohms being included to prevent risk of short circuits. Another method is by the charging rod shown in Fig. 3. This consists of a short piece of brass rod with a glass handle, insulation being obtained by means of a sulphur plug. Friction of the rod on the hair of the head electrifies it negatively, leakage of the charge being prevented by the sulphur. On touching the stem of the electroscope with the charged rod the leaves diverge with the necessary negative charge. This is a very convenient and reliable process if the sulphur be kept clean and not handled.

Experimental Procedure.

When in use the instrument is set up facing the lamp to be studied, and the diaphragm closed to its smallest aperture. A spot of light coming through the diaphragm will appear on the cadmium plate and the cell can be lined up till this is central. With the cap in position and the diaphragm opened to one of the standard sizes, the negative charge is

given to the cell. On removing the cap the gold leaf will be seen to fall steadily if active radiation is present. Two suitable points on the scale are chosen within the travel of the gold leaf (in the instrument in use here, division 11 and division 7). A stop-watch is started by the observer when the leaf crosses division 11, and is stopped when it crosses division 7. This is equivalent to measuring the time which the active light takes to cause the leakage of a definite quantity of electricity from the cadmium plate. Several readings are taken as in the examples given later, and the average of these is used for computation.

Results Obtained with Instrument.

At the outset it may be said that when the research was started it was suspected that photo-electric cells of this description would probably deteriorate quickly with use, through "fatigue," contamination of vacuum, and other causes. These doubts have been found to be groundless. It seems that in the measurement of powerful ultra-violet sources to the accuracy aimed at (an error not in excess of 5 per cent.) these bogies of ordinary photo-electric photometry cause no trouble.

Inverse Square Law.

Other things being equal, the cell should give a leak proportional to the total energy of radiation between $350\mu\mu$ and $200\mu\mu$ entering it—that is to say, using a constant source and keeping the diaphragm to one size, the time of discharge through the standard range should be proportional to the square of the distance from the source. Measurements were made which verified the fact that this relation holds good for cells of the type described, so long as the time of discharge is greater than a certain small value.

Arbitrary Unit of Ultra-violet Intensity.

For the comparison of similar lamps, an arbitrary unit is used which depends on the dimensions of the particular cell used. The unit chosen was a lamp which, when placed 30 in. from the cell, causes the standard leak (division 11 to division 7 on the scale) to take place in nine seconds, the full aperture being used (22 mm.). When a lamp studied, D inches from the cell, discharges the standard amount of electricity in T seconds, the diaphragm opening being A, its power will be given by—

$$P = \frac{1}{100} \times \frac{D^2}{T} \times \left(\frac{22}{A}\right)^2$$

Thus, for the measurement of the power of a lamp, three quantities have to be known—the distance from lamp to cell, the size of aperture used, and a fair average value of the time of discharge.

Constancy of Cell.

The power, calculated by this formula, of a certain quartz-mercury arc as measured on different dates extending over a month was found to be satisfactorily constant: Sept. 27th, 18 units; Oct. 11th, 21 units; Oct. 18th, 23 units; Oct. 20th, 22 units; Oct. 22nd, 22 units. The simplicity of this technique compared with that involved in performing similar measurements with a spectrometer and bolometer or thermopile, or by a photographic method involving measurement of the density of a silver image, is apparent, though admittedly a more rigorous method of radiometry is necessary for the absolute calibration of the cell.

An important advantage of the instrument described here is that it is self-contained, robust, and portable.

Measurements on Carbon Arcs—Solid Carbons.

The outstanding result which emerges from measurements made on carbon arcs is that the great bulk of ultra-violet radiation given out comes from the flame of the arc and not from the poles. Thus, in working with 75 ampère arcs, which have a tendency to flare, whenever a flare occurred an observer at the instrument some 40 ft. away saw the gold leaf *jump* downwards, sometimes a big flare making it drop as much as half a scale division.

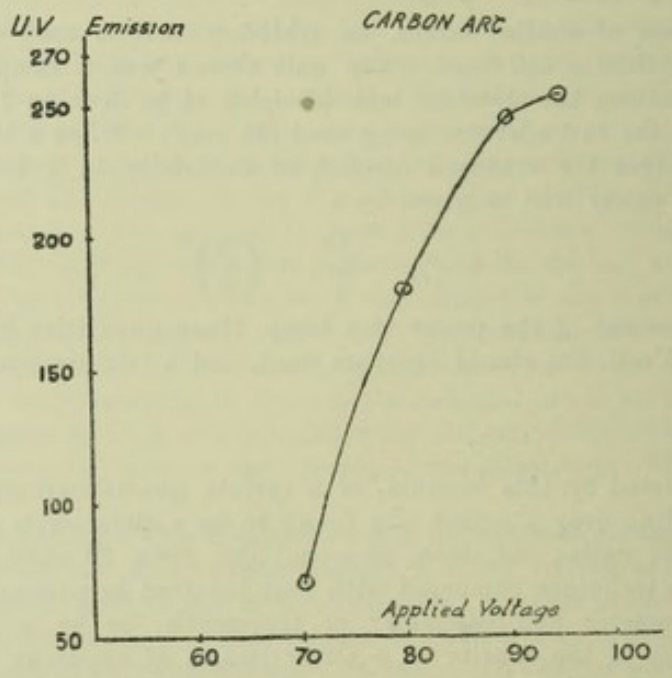
The emission with the carbon arc is, of course, not nearly so constant as that of the mercury arc. The crater tends to move round and round the carbons more or less rhythmically, with the result that the readings of the instrument go through corresponding cycles of maxima and minima. In the estimates of power given below regular readings during at least one complete cycle were obtained, so that the results given are considered to be fair average values of the effective power during an actual irradiation of patients. They were taken at the level of the arc at distances varying according to local conditions of some 20 to 40 ft. away.

The instrument is being adapted to make the averaging for fluctuations of intensity automatic by adding a condenser to it; the standard leak will then take 20 minutes or so to occur instead of 30 seconds, and the result obtained will represent the average power of the arc during the 20 minutes. It has to be noted that the fall of the leaf through the standard range means that a definite amount of ultra-violet energy has been delivered by the arc. It is anticipated that in this form the instrument will give a useful means of controlling dosage.

Variation of Ultra-violet Emission with Voltage.

The power of the 75 ampère arcs, having carbons of diameter 23 mm. and 30 mm., at the City Hospital, Aberdeen has been measured, and its variations with varying input voltage have been determined. The results quoted below (see also Graph, Fig. 4) show that there is very great decrease of ultra-violet emission if the running voltage is allowed to drop some 10 or 15 volts.

FIG. 4.



Voltage.	Power.	Voltage.	Power.
70	70 units.	90	245 units.
80	180 ,,	95	253 ,,

This variation probably arises from the fact that a stable arc is shorter at low voltages than at high. There will thus be less flame, and what there is will be more shielded by the carbons if the applied voltage drops. Relative measurements of the emission of various types of carbon arcs have been made, and the emission has been found to depend largely on the construction and running conditions, a question which is being made the subject of further investigation. The results given below afford a rough guide to the power that may be

expected, and refer in each case to arcs taking solid carbons. The effect of impregnation is to be studied later.

15 amp. type,	. . . .	Power, 12 units.
25 ,, ,,	. . . .	,, 60 ,,
75 ,, ,,	. . . .	,, 156 ,,

These results are in general agreement with those obtained by Lindemann‡ working with smaller arcs under carefully controlled laboratory conditions.

A set of typical readings are given below :—

75 Ampère Carbon Arc.

Distance from arc to cell,	. . . . . 420 in.
Diameter of diaphragm,	. . . . . 15 mm.
Running voltage,	. . . . . 77 volts.
Time of discharge (secs.),	. . . . . Div. 11 to div. 7.

15·0	Effect of a flare
38·0	Arc feeding itself
21·8	
22·0	
21·2	
25·0	
22·6	
18·2	Effect of a flare
27·4	
29·2	
28·8	

} Average time, 24·5 secs.

$$\text{Power of arc} = \frac{1}{100} \times \frac{D^2}{T} \times \left(\frac{22}{A}\right)^2 = \frac{1}{100} \times \frac{420^2}{24{\cdot}5} \times \left(\frac{22}{15}\right)^2$$

The relative steadiness of the mercury arc is shown by the following readings :—

3 Ampère Mercury Arc, Type A.

Distance from arc to cell,	. . . . . 89 in.
Diameter of Diaphragm,	. . . . . 8 mm.
Time of discharge (secs.) :—	

26·2	26·2
25·8	26·6
26·2	26·6
26·6	26·6
26·8	26·2
27·0	26·4

} Average time, 26·5 secs.

Hence power of lamp, 22 units.

Measurements on Mercury Arcs.

Two types of mercury arcs have been investigated, an "atmospheric" type with tube length 5 cm., diameter 14 mm., taking 2·2 amps. at 100 volts across the tube; it has a hemispherical white enamel bowl above it. This will be referred to as lamp A.

Lamp B is a vacuum type lamp, tube length 8 cm., diameter 15 mm., taking 2·8 amps. at 156 volts across the tube. It has a hemispherical polished metal bowl behind it.

Measurements have been made of the powers of both lamps. A typical series of measurements for lamp A has been given above. The small variations are assigned to slight alteration of arc length or supply voltage. They are even less in the case of lamp B.

Power of mercury lamp	A,	. . . 20·9 units.
,, ,,	B,	. . . 57 ,,

‡ Lindemann : Annalen der Physik, 1906, xix., 807.

These measurements were made with the cell on a horizontal line from the lamp perpendicular to the tube length, the bowls being tilted to expose the quartz tubes completely. Thus the ultra-violet emission of B was about three times that of A.

Measurements have also been made of the distribution of ultra-violet energy round lamp A.

Along horizontal line perpendicular to tube length, . . .	20·9 units.
Along horizontal line at 45°, perpendicular to tube length, . .	14·7 ,,
Along line sloping downwards at 45°, perpendicular to tube length, .	19·8 ,,
Vertically under lamp, ...	32 ,,

Measurements are in progress of the effect of the bowl-shaped reflector in focusing the ultra-violet energy, and of the effect of voltage variation on the ultra-violet output.

General Considerations.

Another fact which requires consideration is that the instrument gives a directly valid comparison of the powers of sources of a similar nature—*e.g.*, of two different sizes of carbon arcs, or of two types of mercury arcs. In comparing a carbon arc with a mercury arc, however, one other factor has to be taken into account, since the mercury arc is relatively richer in short waves than the carbon arc, in the region to which the instrument is sensitive. This is the usual difficulty of heterochromatic photometry, exactly analogous to the difficulty of comparing a lamp of bluish tint with a yellowish one; to settle this point it is necessary to know how the sensitivity of the measuring instrument varies with the wave length. Preliminary tests have shown that the sensitivity of the instrument to different wave-lengths in the band of the spectrum to which it responds is not far from uniformity. This detail is being investigated at present, but meanwhile it is not considered to be of great practical importance, at any rate until the problem has been solved as to what are the relative biological effects of the same amounts of ultra-violet energy applied in the form of mercury arc radiation, and of carbon arc radiation respectively.

It is interesting to note that a sheet of window glass held in front of the diaphragm stops all leak as completely as does the cardboard cap of the instrument, thus showing conclusively that only waves shorter than about 350 $\mu\mu$ actuate the instrument.

A further form of apparatus is in use, in which the photo-electric leak across the cell is balanced by adjusting a resistance which allows current to flow in, so as just to neutralise the leak. The variable resistance, which must be of the order of 10 million megohms, takes the form of a thermionic valve with a very small quartz-insulated anode. In using this type, all that is required is simply to set the resistance till the gold leaf is stationary. Then the intensity of ultra-violet illumination is read off directly from the setting of the instrument, instead of indirectly from observation of the fall of the leaf, as in the first type described.

B.—(1) The Relation of the Bactericidal to Photo-electric Activity of Various Sources of Ultra-violet Radiation.

The following paper gives some results of a series of experiments on the bactericidal power of various sources of ultra-violet radiation. The "power" of the source was in each case measured by the quartz-cadmium photo-electric cell described by the authors (above), and it is shown that very definite and practically useful correlations exist between the cell reading and this typical abiotic action.

Method.—Cultures were prepared by spreading a uniform layer of an emulsion of the bacteria to be investigated on agar in Petri dishes. The opaque covers of the dishes were provided with two natural quartz windows through which the exposures were made, two separate exposures being generally possible on one plate. After exposure the cultures were incubated and the resultant distribution of colonies studied. This bacteria employed were *Staphylococcus albus* in the main series of experiments, and the end point was found to be

surprisingly definite. *Streptococcus scarlatinæ* was also used in a few cases, but with inferior results as regards sharpness of end point. The lethal exposure could be determined with an error not exceeding 10 per cent. Whole series of experiments were carried out using as far as possible one emulsion of bacteria, spread at the same time. Where this was not possible, the relative susceptibility of the cultures used was estimated and any small difference found was allowed for in comparing results with those obtained from another emulsion.

It will be seen that the lethal exposures necessary were generally of the order of 3 or 4 minutes at 3 feet from the lamps, going up to a maximum of 9 minutes for the weakest lamp. It was probable, therefore, that the lethal effect of direct heating by the absorption of radiation was negligible. This was confirmed when it was ascertained that the rise of temperature as measured by a thermopile immersed in the culture medium under the quartz window was of the order of 3° C. after 10 minutes' exposure in the case of the 800 watt carbon arc, where it would be greatest.

Control experiments showed that there was no sign of activation of the culture medium consequent upon irradiation, as would be expected from the work of Coblentz and Fulton (1925), who found activation only with exposures very much greater than those used in our experiments.

Calculation of Results.

The photo-electric power is obtained as described in our previous paper (1925). Briefly, it involves determination of three quantities—the distance from lamp to cell (D) inches, the time of discharge of the cell through the standard range (T secs.), and the size of the diaphragm used (A mm.). The photo-electric power is then given by

$$P = \frac{1}{100} \times \frac{D^2}{T} \times \left(\frac{22}{A}\right)^2.$$

The units in which the result is expressed are then arbitrary, analogous to the candle power of an ordinary source. The authors have become accustomed to refer to them as "U.-V. Candles."

The bactericidal power is defined in terms of that of a mercury arc, which was known to be in steady running condition. Its killing time on a culture distant 3 feet was found to be 4·75 minutes, and its bactericidal power taken as 32 units, to agree with the "ultra-violet candle power" measured by the cell. Then, if another lamp D feet away kills in T minutes, the bactericidal power of that lamp is defined as

$$32\left(\frac{D}{3}\right)^2 \times \frac{4{\cdot}75}{T} = 16{\cdot}9\ \frac{D^2}{T}.$$

The methods used depend on two fundamental assumptions—that the lethal action is proportional to the time of exposure, and that the killing time is proportional to the square of the distance from the lamp. These are taken as verified to sufficient approximation by the results of Coblentz and Fulton (1925) and of Leonard Hill (1923), over the range of light intensities (1 : 2) involved in this work.

The bactericidal and photo-electric powers agree by definition for the standard mercury lamp; results will now be given showing how far there is agreement in other types of lamp.

	Watts.	Distance (feet)	Killing time (mins.)	Photo-electric power.	Bactericidal power.
Carbon . .	4,500	12	3·5	550	690
,, . .	700	3	8·5	15	18
,, . .	—	3	9·75	14	15
Tungsten . .	364	3	2·75	62	55
,, . .	175	3	6·5	20	23
Mercury A . .	291	3	4·5	40	34
,, B . .	358	3	4·75	32	32
Iron . . .	400	3	5·75	22	26

From these results it will be seen that in lamps of powers varying in the ratio 1 : 40 and of very different construction, the bactericidal activity follows the photo-electric activity in the quartz-cadmium cell within the limits of 1 : 1·3.

In a second series of experiments, the bactericidal activity of sources was investigated by finding how far a culture has to be placed from the lamp to be sterilised in 4 minutes.

	Watts.	Distance (ins.)	Killing time (mins.)	Photo-electric power.	Bactericidal power.
Carbon . .	700	37	4	37	41
Tungsten . .	380	69	4	120	140
Iron . . .	400	26	4	21	20
Mercury . .	410	73	4	150	158

Experiments are in progress designed to elucidate the full nature of this agreement by systematic investigation of the relation of reaction to wave-length (for radiation of definite energy, as measured by a bolometer) both in the case of the photo-electric action and that of the bactericidal action, in extension of the experiments of Browning and Russ (1917). The work of Clarke and Watters (1922), and of Osgood (1924), make it clear that this agreement was likely to exist.

(Incubation for half an hour after spreading increases susceptibility to ultra-violet about 4·5 times).

(2) Comparison of Various Sources of Radiation.

The following results give the "ultra-violet candle powers" of various sources as measured by the quartz-cadmium cell.

Quartz-Mercury Arcs.

Quantitative measurements of the total ultra-violet emission (between 450$\mu\mu$ and 170$\mu\mu$) of quartz-mercury arcs have been made by Coblentz (1921), but our measurements, which are in general agreement with his, are of interest as they refer to the narrower region of the ultra-violet (350$\mu\mu$ to 220$\mu\mu$) upon the biotic effects of which attention is at present mainly centred. In every lamp tested there are temporary large and complex variations of ultra-violet emission just after the lamp has been switched on, and to a less extent when the current is altered. These involve a number of factors, including temperature changes in the burner and series resistance of the lamp, which require 20 minutes or so to adjust themselves, after which the emission reaches a steady value. In each case this steady state was reached before taking observations.

Variation of Ultra-violet Emission with Watts In-put. Type A.

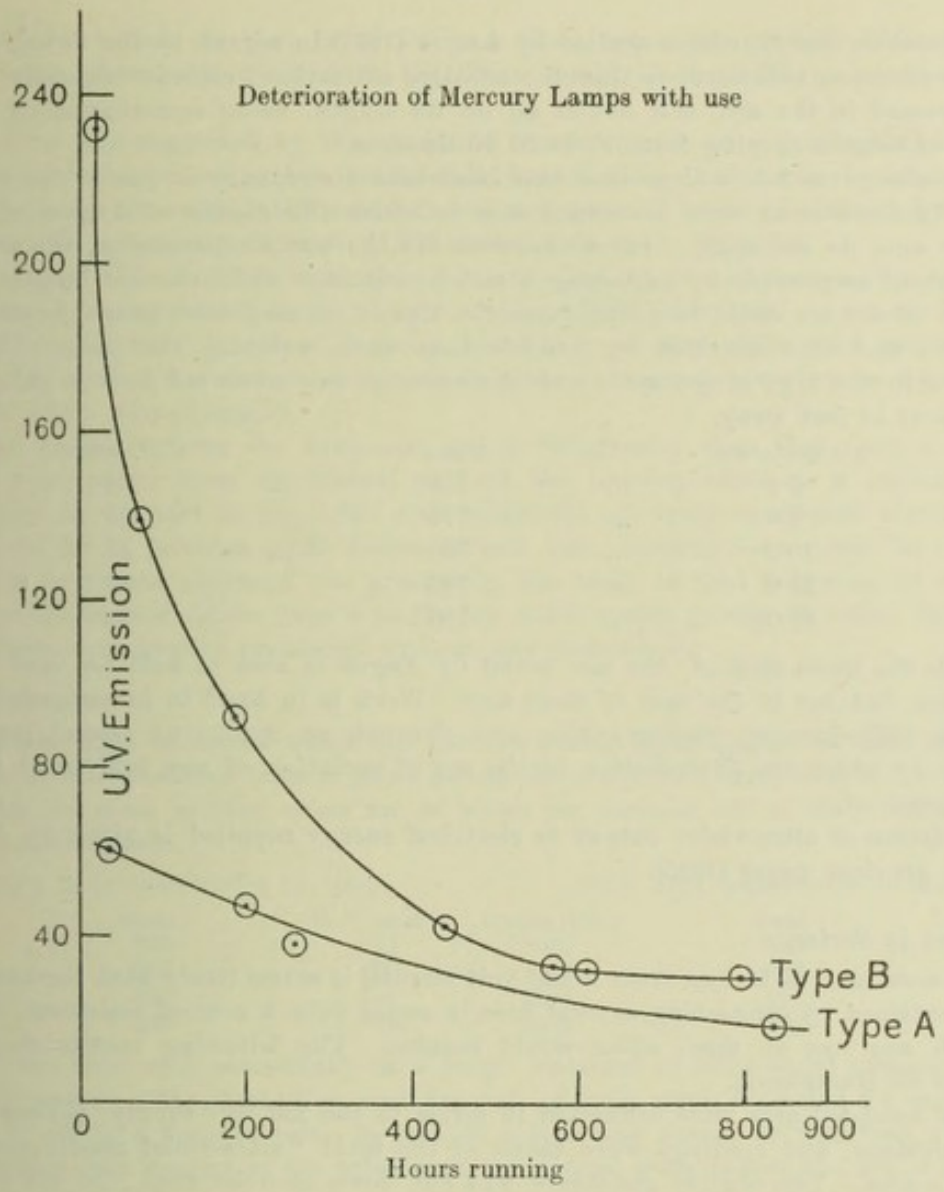
Amps.	Watts.	U.-V. power.	Line volts.
1·5	162	15	170
2·0	212	21	188
2·3	234	23	196
3·0	291	35	220

Thus a decrease of line-voltage of 5 per cent. causes a decrease of 14 per cent. in the emission of the lamp.

This is in close agreement with the result obtained by Coblentz (1921) using the thermopile and filters, as mentioned above. Measurements were also made by Henri (1911) using the lethal effect on *Bacillus coli* as his measure of the ultra-violet emission, and show a somewhat greater variation than was found in our experiments.

Deterioration of Lamps with Use.

Two types of lamp have been studied—(1) a Hanau "vacuum" lamp B, taking 3 amps. at 126 volts across the tube, and (2) a K.B.B. "atmospheric" lamp A, taking 3 amps. at 97 volts. Both lamps were running under the conditions laid down by their makers for hospital use.



It is seen that the vacuum lamp, though initially 4 times as powerful as the atmospheric type, deteriorates far more rapidly. Measurements made by Coblentz (1921) and by Moss and Knapp (1925) by a photo-chemical method agree with the results we find for lamp A. It will be apparent that this very rapid deterioration of Type B makes it a matter of some difficulty to control dosage when the lamp is new.

Type A.				Type B.		
Hours used.		U.-V. emission.		Hours used.		U.-V. emission.
—	...	—	...	10	...	230
15	...	56	...	70	...	138
–	...	—	...	190	...	90
200	...	44	...	390	...	66
—	...	—	...	450	...	40
840	...	15	...	580	...	32
—	...	—	...	800	...	29

Carbon Arcs.

A detailed study of this arc was made by Lindemann (1906) for small arcs, by a photo-electric method, using a copper oxide cathode which would be mainly sensitive to radiation shorter than 250 $\mu\mu$. It is implicit in his work that a small arc is a less powerful source of ultra-violet radiation than a longer one consuming the same electrical energy.

This question has also been studied by Angus (1925) in regard to the lethal effect of the arc on *Paramecium*, and he finds that the effective ultra-violet emission depends only on the power consumed in the arc, and not at all on its length, using arcs consuming about 1,700 watts and of lengths varying from 10 to 50 millimetres.

The results given below show that this important discrepancy is due to the fact that the arcs used by Lindemann were low-power arcs to which the results of Angus, obtained with high-power arcs, do not apply. In our experiments the watts consumed in the arc were kept as far constant as possible by adjusting a series resistance while the arc length was varied. The length of the arc could be found from the size of its magnified image formed by a lens on a screen, and kept constant by hand-feeding while watching the image. The carbons were in line in the type of arc used, and the emission was measured from a point level with the arc, about 10 feet away.

Arc length mm.		Watts.		U.-V. power.
3·4	...	756	...	14
6·8	...	776	....	23
10·2	...	756	...	31
13·6	...	766	...	35
17·0	...	756	...	36

Thus in the cases studied, the law found by Angus is seen to hold for arcs longer than about 12 mm. but not in the case of short arcs. Work is in hand to investigate the mechanism of this difference by photographing arcs through an apparatus resembling a spectro-heliograph, by which the distribution in the arc of radiation of any individual wave length can be determined.

The relation of ultra-violet output to electrical energy supplied is given by Angus (1925) and in our previous paper (1925).

Carbon Arcs in Series.

When arcs have to be run from a 220 volt circuit, it seems likely that increased efficiency might be obtained by connecting several arcs in series with a control resistance smaller than that which any one of them alone would require. The following results show that this method has its limitations.

Several hand-fed arcs were connected in series to the 220 volt supply, through a variable control resistance, and readings were taken of the total "ultra-violet candle power" of the composite source. The control resistance was cut down step by step, the arc length being set in each case so as to keep the current at 11 amps., so that the power taken from the mains was always 2,200 watts.

Number of arcs.	External resist. ohms.	Watts in arcs.	Total U.-V. cand.	Total length mm.	Watts per arc.	U.-V. cand. per arc.	Length per arc mm.
3	5·1	1,800	29	15	600	10	5
3	4·2	1,840	37	18	613	12	6
3	3·5	1,940	50	20	645	17	7
3	2·0	2,068			Arcs unstable.		
2	8·3	1,276	42	14	638	21	7
2	5·1	1,540	69	24	770	35	12
			(Nearly unworkable.)				
1	15·0	680	25	11	—	—	—
—	—	—	—	—	—	—	—
1	12·0	770	35	16	—	—	—
1	9·7	1,100	52	22	—	—	—

These results show that as much ultra-violet emission can be got from one suitably designed (long) arc as from a group of several arcs in series taking the same electrical power from the mains (2,200 watts). The reason for this appears in column 5, the total length of flame compatible with stable working being about the same whether it occurs in one single

arc, or in three in series; so that, in so far as a short arc is less efficient than a long one taking the same power, sub-division of the flame would be expected to result in loss of efficiency.

This problem was suggested by the results of measurements on a commercial therapeutic lamp consisting of four short arcs in series with hand-feeding, and series resistance 9 ohms. It took 13 amps. at 220 volts (2,860 watts) in all, and gave 13 units of ultra-violet emission; whereas one single arc taking 11 amps. (2,200 watts) gave up to 52 units.

In the case of higher power arcs, the above conclusions do not necessarily apply, since here, efficiency is independent of arc length. Also, their individual automatic regulators may enable the total flame length of a group in series to be more than that possible for one single arc. But here other factors enter which make it usual in practice to work them in parallel from a low voltage supply.

The total radiation from the composite arc is far greater than that from a single arc taking the same power from the mains, so that the heating effect on a patient is much greater. Thus, in the case of the 2,860 watt composite arc lamp mentioned above, exposure of the forearm for 22 minutes at 20 inches caused more heating than could be comfortably endured. The erythema produced was practically the same as that following an exposure of 10 minutes at the same distance from a single arc (2,200 watts) giving 35 units; this exposure could have been very greatly prolonged without any discomfort.

"Cinema" Type Arc.

The emission from an arc in which the carbons are at right angles, so that the crater is wholly exposed, was measured from a point facing the crater and level with it. It was found to be sensibly the same as that of an arc in which the carbons are in line, which consumed the same electrical power.

Tungsten Arcs (electrodes in line).

Length (mm.)	Watts.	U.-V. emission.
6·8	326	77
13·6	348	100
20·4	360	102
6·8	206	19

Iron Arcs (electrodes in line).

Length (mm.)	Watts	U.-V. emission.
5·0	322	15
13·6	400	22
20·4	498	23
34·0	460	23

This arc has been used successfully as a rough standard of ultra-violet emission (23 ultra-violet candle power). The electrodes used are rods of mild steel, diameter 6·4 mm., and the arc length is set to a definite value by use of a lens and screen as described above. The button of molten iron formed at the poles must be chipped away before the arc is restarted.

III.—TREATMENT BY SUNLIGHT AND THERAPEUTIC LAMPS OF CASES OF PULMONARY AND EXTRAPULMONARY TUBERCULOSIS.

The following report on the treatment by ultra-violet radiation of cases of pulmonary and extrapulmonary tuberculosis relates to an intensive experimental investigation which is at present being carried out by Drs. Banks and Taylor and which they will publish in detail when they are in a position to submit full statistical and clinical evidence of their findings. The present preliminary report is submitted for the information of other workers.

The technique of the heliotherapy of tuberculosis as practised in the City Hospital during the six summer months of 1925 and 1926 is as set forth in the Annual Report of the Medical Officer of Health for 1924 (pp. 109-117), the régime being followed according to the physical condition of the patient, his susceptibility to sunlight, the nature of the lesion, and the intensity of the sunshine.

In general, it may be said that the results of heliotherapy on cases of surgical tuberculosis in the City Hospital were in every way as successful as the results recorded elsewhere, and need not be discussed in detail.

The physical condition of the patient and his reaction to radiation, which determine wholly the amount of exposure to sunlight in cases of surgical tuberculosis, are of even greater importance in determining the exposure of cases of pulmonary tuberculosis to sunlight.

The Aberdeen experience has convinced us that the failure of other workers, with the exception of de Grasso and Balderrey (1) to obtain beneficial results from the sunlight treatment of pulmonary cases has resulted from their adoption of a hard-and-fast technique and their failure to base the régime wholly on the reaction of the individual patient. The findings of Wood (2) as recorded in the *Lancet*, subsequent to the preparation of the present Report, are in general agreement with this view.

Before insolation is commenced, all chest cases are acclimatised to open-air conditions of life, and all undergo that period of rest, which, together with adequate diet and hygienic surroundings, puts them in proper condition to derive benefit from irradiation. The patient being thus prepared, Rollier's method (3) of insolation, as modified by de Grasso, is employed —the feet being exposed on the first day for five minutes, and each day a further surface of the body being exposed from below upwards, the time of exposure being extended each day by five minutes, until a maximum of one hour's exposure for the whole body is given morning and afternoon. Careful note is made in all cases of temperature and pulse before and after irradiation and the response of the skin to the radiation is also recorded daily. Overheating during and exhaustion after irradiation are noted; frequency of cough and amount of sputum during and between exposures are estimated; and if from all or one of these signs it is indicated that the treatment is increasing toxaemia, then the dosage is reduced, and, if necessary, the treatment is discontinued.

It has been found that heliotherapy is contra-indicated in cases of acute disease with much toxæmia and high temperature, in cases with acute complications such as pleurisy, pyothorax, &c., and in cases with recent hæmorrhage. On the other hand, cases with a moderate toxæmia, shown by a temperature of 99° to 101° F., benefit by cautiously regulated exposure to the rays. The chronic type of case tending to fibrosis and healing is, almost without exception, benefited by sun and artificial light treatment, and recovery is hastened. It is here especially that light has proved a most important adjunct to treatment. Once the tuberculous lesions in the lungs have become quiescent, adults are no longer confined to bed, and receive their irradiation reclining in deck chairs. So also with children, when the tuberculous lesion has become quiescent, they are allowed to disport themselves nude, except for short pants, in the grounds of the hospital, or on the seashore 400 yards distant.

Treatment by Artificial Sunlight in Cases of Pulmonary Tuberculosis and Extrapulmonary Tuberculosis.

The following therapeutic lamps have been installed at the City Hospital:—

In one of the tuberculosis pavilions—

2 75-ampère long flame carbon arc lamps in series (Watson);
4 atmospheric quartz vapour lamps (Kelvin, Bottomley, and Baird);
1 vacuum-mercury vapour lamp (Hanovia);
1 Kromayer lamp (Hanovia).

In another tuberculosis pavilion—

4 vacuum quartz mercury vapour lamps (Hanovia).

In the ailing infants' ward—

1 atmospheric quartz mercury vapour lamp, surrounded by
4 large Osram lamps, each of 300 watts, to provide heat rays along with the ultra-violet rays.

In each of the fever wards—

1 vacuum quartz mercury vapour lamp. 1 atmospheric quartz mercury vapour lamp has also been installed in the scarlet fever ward.

In the pneumonia ward—

1 15-ampère portable carbon arc lamp.

For the purposes of the experiments it was realised that, if the maximum benefit of artificial light was to be obtained, then all the other conditions should be made as nearly approaching the best summer-time open-air conditions as possible. The ultra-violet emission of all the lamps was determined by the photo-electric cell as already described. The deterioration of the mercury vapour lamps was regularly calculated, with the result that the ultra-violet dosage could be accurately administered.

Carbon Arc Lamps.

Patients are protected from the carbon arc lamps (which are suspended from the roof and balanced by a counterweight) by a large mesh grid surrounding the lamps. Circular mattresses, 2 feet 6 inches in width and 9 inches thick, surround the lamps beyond the grid, so that when sitting or reclining on the mattresses the patient, with his eyes protected by goggles of Crooke's glass, is kept at a constant distance of 3 feet from the arc. The arc is maintained at a constant height—that of the level of the shoulders of a seated adult of average height, while the ultra-violet emission of 200 units is kept practically constant by maintaining the running voltage at 85.

Mercury Vapour Lamps.

The mercury vapour lamps are also suspended from the roof, balanced by a counterweight, and, when required for use, are lowered to within 3 feet of the patient lying prone perpendicularly under the lamp. The lamp is allowed to burn for ten minutes before exposure is commenced, to permit of a steady emission, and the patient, with his eyes protected by Crooke's goggles, is irradiated.

Method of Irradiation with Therapeutic Lamps.

Ultra-violet dosage having been accurately determined, and the conditions otherwise having been made as nearly approximating open-air conditions of life as possible, the technique of ultra-violet radiation resolves itself into a question of the patient's general reaction and cutaneous reaction. Reference has already been made to the importance of controlling dosage according to the general reaction of the patient, and need not be further discussed.

As regards the cutaneous reaction, it would appear that the best biological result is obtained by keeping the skin young, that is, by keeping it fully responsive to an erythema dose rather than seeking to induce an intense and more or less permanent pigmentation. It has been found that an exposure of one hour daily to the atmospheric quartz mercury vapour lamp, and of ten minutes daily to the 75-ampere carbon arc lamp, best secures this mild reaction which is associated with a moderate degree of pigmentation; and it will be noted that the difference in length of exposure (60 minutes to 10 minutes) compares almost exactly with the difference in arbitrary units as estimated by the photo-electric cell, viz., 200 to 40. It is scarcely necessary to add that the patient must be very gradually acclimatised to such ultra-violet exposure.

The urgent need for caution in estimating the duration of exposure and the danger that the patient may suffer from over-dosage, will readily be appreciated when it is recognised that the emission of a new mercury vapour lamp (Hanovia) is reduced from 220 units when new to 30 units after 800 hours' use. Preliminary testing with the photo-electric cell and subsequent fortnightly examinations obviate these dangers. In other words, such tests are essential if a measure of the decay of the lamp is to be obtained and the length of exposure

required by patients with a view to securing optimum results is to be determined. Certainly no lamp should be used for therapeutic purposes until its ultra-violet emission has been determined.

Beyond all these factors of amperage, voltage, time of exposure, and distance from the source of ultra-violet emission, which must be taken into account in providing artificial ultra-violet therapy, the idiosyncrasy of the patient is most important of all. Exhaustion, sweating, lethargy, and variability in reaction have all to be noted, but, in general, the following régime has proved useful as a guide:—

Full Dosage.—Those with dark complexions; those who tan on exposure to the sun.
Three-quarter Dosage.—Fair people; those with blond or reddish hair.
Half Dosage.—All patients whose skin is specially sensitive; children from 3 to 10 years.
Quarter Dosage or Less.—Marasmic infants.

Effect of Irradiation on Patients.

During the past year, 78 adults (34 males and 44 females), 60 phthisical children (20 males and 40 females), and 51 adults and children suffering from the so-called surgical or extrapulmonary tuberculosis, have received heliotherapy and artificial sunlight treatment. Of the 78 adults suffering from pulmonary tuberculosis, 92 per cent. were classified Stage 3 in the Turban-Gerhardt classification by the Tuberculosis Medical Officer.

In the following description of the effect of ultra-violet radiation on tuberculous patients, no attempt is made to provide statistical evidence of the benefits that accrue to such patients thus irradiated as contrasted with patients who do not receive radiant treatment.

To permit of such a comparison as between patients receiving natural heliotherapy, artificial light treatment, and general sanatorium treatment without irradiation respectively, it would be necessary in the first place to select three groups of tuberculous patients corresponding in so far as their clinical manifestations of the disease are concerned, and to subject the three separate groups to a uniform and rigid out-of-doors régime—the regulation of diet, fresh air, rest of body and mind, and graduated exercises being identical for the three groups. The comparison would then require to be made as between the first group protected from the ultra-violet rays of the sun, the second group receiving sunlight treatment, and the third group being irradiated by ultra-violet lamps.

Even were the conditions of the comparison to be thus standardised, the test would not give an accurate measure of the effect of irradiation alone, since the exposure of the skin to the stimulating effect of flowing fresh air in the irradiated patients would introduce a disturbing factor of cutaneous response to ventilation independent of the cutaneous response to ultra-violet rays.

In fact, it can be accepted that the rigid conditions necessary to such a comparison could only be imposed in an experimental investigation applied to lower animals and not to man, and, in such an experiment with lower animals, would have to be long continued with a large number of animals. Even at the conclusion of such an experiment, the deductions to be drawn from the results obtained would be subject to controversy.

In attempting, therefore, to assess the value of the therapeutic results that are to be obtained from the ultra-violet radiation, the physician, as in his assessment of the value of many other therapeutic agencies, is compelled to base his opinion on the conviction that is gradually forced on his understanding as a result of repeated clinical impressions and findings. In this connection, and prior to any scientific success in standardising ultra-violet dosage, there has been a great body of professional opinion convinced of the therapeutic value of ultra-violet radiation, such an opinion being most strongly held by those most competent to judge, viz., the physicians who have observed the results of ultra-violet therapy in operation.

The following cases receiving ultra-violet therapy are put on record, therefore, simply with a view to informing other workers of the type of case (and in the vast majority of cases

it has been the advanced case, not only of surgical tuberculosis but of pulmonary tuberculosis) which has been submitted to ultra-violet therapy, and of the response of such cases to irradiation.

Of the 78 adults suffering from pulmonary tuberculosis, 92 per cent. of which were classified Turban-Gerhardt Stage 3, 39, or 50 per cent., have improved; 26, or 33·3 per cent., have remained stationary; 9, or 11·6 per cent., have retrogressed; and 4, or 5·1 per cent., have died.

The 60 children suffering from hilus tuberculosis all have made the most favourable progress, as was to be expected.

Of the 51 cases of surgical tuberculosis, 39, or 71 per cent., have improved; 8, or 15·7 per cent., have remained stationary; 3, or 6 per cent., have retrogressed; and 1 has died.

Of these 51 cases of surgical tuberculosis, 31 were cases of glandular tuberculosis, and the 4 of these that remained stationary and 2 that retrogressed were in the caseating stage, and required surgical interference. There were 15 cases of bone tuberculosis; and of the 4 that remained stationary, the one that retrogressed and the one that died, 4 were from the beginning of treatment advanced cases of tuberculosis of the spine and 2 advanced cases of tuberculosis of the hip joint. Admirable results were obtained with the 5 cases of abdominal tuberculosis.

It is necessary to stress the remarkable general response of practically all tuberculous patients, both pulmonary and extrapulmonary, to ultra-violet treatment. The necessity of counteracting the tendency of such patients to become morbid and dispirited was one of the most difficult problems of institutional treatment in former days, but, with the advent of heliotherapy as enforced by artificial light therapy, the tendency to introspection and pessimism has been replaced by an optimism of the best description. The patients almost invariably, and at all stages of the disease, become bright and cheerful. They appear to realise that they are undergoing a treatment requiring rigid, constant, and expert supervision, providing a new prospect of recovery, as contrasted with the older impression that the institutional treatment of advanced cases of tuberculosis was essentially a matter of segregation and practically of incarceration.

An indirect but valuable expression of this mental response to ultra-violet therapy is observed in the nursing staff. In former days, junior nurses wept when delegated for duty to the wards for advanced consumptives, but, with the advent of intensive ultra-violet therapy in such wards, there is a healthy rivalry to undertake such duty.

Finally, it is suggested that the evidence submitted warrants the conclusion that, under controlled conditions and even with advanced cases of tuberculosis, the application of ultra-violet therapy in measured doses can be safely employed, and has made possible a great development of a general therapeutic agency of the highest order.

Summary.

Treatment of Cases of Tuberculosis with Measured Doses of Ultra-Violet Radiation.

Clinical evidence is submitted which goes to prove that great benefit is derived from ultra-violet radiation, provided that (*a*) the patient's body is exposed to radiation according to de Grasso's modification of Rollier's graduated method; (*b*) the environmental conditions otherwise and the nutrition of the patient is of the best description; and (*c*) the dosage of ultra-violet rays is strictly regulated.

Therapeutic lamps have been used regularly to supply deficiencies in sunlight, and it has been found that of 78 adults, 92 per cent. of which were classified as Turban-Gerhardt's Stage 3, 39, or 50 per cent., have improved; 26, or 33 per cent., have remained stationary; 9, or 11·6 per cent., have retrogressed; and 4, or 5·1 per cent., have died. Of 60 children suffering from hilus tuberculosis and general debility, all have made remarkable progress. Of 51 cases of surgical tuberculosis, 39, or 71 per cent., improved; 8, or 15·7 per cent., remained stationary; 3, or 6 per cent., retrogressed; and 1 died. The change in the mental condition of the patients is even more remarkable than the physical improvement. Under ultra-violet treatment, cases of tuberculosis in all stages of the disease become bright and cheerful, and appear to be satisfied that the treatment affords a new prospect of recovery.

It has long been recognised that the essential agencies in the treatment of all forms of tuberculosis are fresh air, sunlight, and adequate diet, and rest of body and mind followed by graduated exercises. Thus, it is known that the benefit derived from fresh air depends mainly on the physical condition of the air as it affects the heat-regulating mechanism of the body, and that changes of temperature, moisture, and movement of the air are all-important. So also it has been ascertained that, in a diet requisite to maintain health and increase resistance to disease, the presence of such vitamins as Fat Soluble A and Water Soluble B is as essential as are proteins, fats, carbo-hydrates, and salts of an adequate nature and amount. So also the part played by radiant energy in maintaining health and increasing resistance to disease has for long been generally recognised.

As a result of this research, it is now possible to measure accurately ultra-violet dosage and to apply this preventive and curative agency with new precision and greater effect.

REFERENCES.

(1) De Grasso and Balderrey—Am. Review of Tuberculosis, Oct., 1924, p. 121.
(2) Wood, J. E.—Lancet, II., Aug., 21, 1926.
(3) Rollier—"Heliotherapy," p. 23. Frowde, Hodder & Stoughton, 1923.

CONCLUSIONS RELATING TO PAPERS II. AND III.

1. A photo-electric cell with a recording gold-leaf electroscope has been devised, which is capable of measuring the emission of those ultra-violet radiations which are of greatest biological interest, namely, radiations from 350$\mu\mu$ to 200$\mu\mu$.
2. An arbitrary unit of ultra-violet radiation, which depends on the dimensions of this photo-electric cell, has been defined, and can be used for making comparisons between different sources of ultra-violet radiation.
3. The ultra-violet emission of all forms of carbon arc lamps and mercury vapour lamps can readily be measured by means of the photo-electric cell and recording gold-leaf electroscope.
4. It has been demonstrated by means of this instrument for measuring ultra-violet radiation that there is a great decrease in ultra-violet radiation of carbon arc lamps if the running voltage is reduced.
5. It has been shown that there are temporary large and complex variations of ultra-violet emission from every form of therapeutic lamp just after the lamp has been switched on, and to a less extent when the current is altered. These variations involve a number of factors, including temperature, changes in the burner, and series resistance of the lamp.
6. It has been demonstrated that as much ultra-violet emission can be got from one suitably designed arc as from a group of special arcs in series taking the same electrical power from the main.
7. It has been demonstrated that both vacuum mercury vapour lamps and atmospheric mercury vapour lamps deteriorate rapidly with use in regard to their ultra-violet emission.
8. It has been demonstrated that it is necessary to measure the output of ultra-violet rays from all forms of therapeutic lamps at regular and frequent intervals if the dose of ultra-violet radiation for therapeutic purposes is to be accurately determined.

9. The relation between the bactericidal power and the photo-electric activity of various sources of ultra-violet radiation has been determined, and it has been shown that, with lamps of powers varying in the ratio 1 :40 and of very different construction, the bactericidal activity follows the photo-electric activity in the quartz cadmium cell within the limits of 1 to 1·3.
10. Clinical evidence is submitted which corroborates the finding of other workers to the effect that cases of surgical tuberculosis benefit greatly by ultra-violet radiation.
11. Clinical evidence is submitted which goes to prove that patients suffering from pulmonary tuberculosis derive great benefit from ultra-violet radiation, provided that (*a*) the patient's body is exposed to radiation according to de Grasso's modification of Rollier's graduated method; (*b*) the environmental conditions otherwise and the nutrition of the patient is of the best description; and (*c*) the dosage of ultra-violet rays is strictly regulated.
12. As a result of this research, it is now possible to measure accurately ultra-violet dosage and to apply this preventive and curative agency with new precision and greater effect.

IV.—THE CAUSATION OF RICKETS

A Preliminary Note on the production of experimental Rickets in rats and its prevention and cure; together with a measurement of the Vitamin A and Vitamin D content of cod liver oil, ostelin, and devitalised oils; and the clinical application of these findings.

The comprehensive investigation of the causation, prevention, and cure of rickets by Mr. Griffith and Drs. John S. Taylor and Mabel Wilson has been in progress for over a year within the Aberdeen City Hospital, and a full description of the results obtained by these investigators will be published in due course under the ægis of the Committee on Rickets in Scotland. This investigation, which is being conducted by the City Health Department in conjunction with the Rowett Nutritional Research Institute, is part of the programme of research into the wider problem of nutrition in children, which has been approved by the Scottish Rickets Committee.

This preliminary note is submitted merely to indicate the lines along which the research is progressing.

It is important also that there should be immediate and general recognition of the fact that recent developments in the trade processes of extracting and refining cod liver oil have resulted in the vitamin content of the various oils at present on the market being extremely variable, and have made it of first importance that a measure of the activated content of such oils should be readily available if the therapeutic results desired from the exhibition of these oils is to be obtained. So also recent developments in manufacturing processes whereby the antirachitic

substance in cod liver oil has been extracted and put on the market in various forms under trade names, such as Ostelin, and whereby the inactivated residue forming the main bulk of the oil may be marketed as a high grade oil for medicinal purposes, have accentuated the need for such a test or measure of the vitamin content.

Recent Experimental Work on Rickets.

A review of recent researches into the etiology, prevention, and cure of rickets by Professor Leonard Hill, is in process of publication by the Medical Research Council, and it is sufficient to indicate here that the recent work on rickets has shown that the diseased calcification of the growing bones result from (*a*) a diet deficient in antirachitic substances, and (*b*) lack of ultra-violet rays.

It has been proved that the antirachitic substance present in cod liver oil, which is here designated Vitamin D, is distinct in its action from Vitamin A. Thus, Goldblatt and Silva (1) and Hume (2) have shown that, if rats are fed on a rachitogenic diet, xerophthalmia and rickets are produced. If, however, the animals are irradiated with a quartz mercury vapour lamp at the same time, the xerophthalmia develops in the usual way, but the pathological changes in the bones are slow in appearing, and then only to a slight extent. These workers conclude, therefore, that the antirachitic factor of cod liver oil and Vitamin Fat Soluble A are not one and the same, that there is some other factor present, probably a specific antirachitic vitamin, Vitamin D. So also, Steenbock and his co-workers (3) have shown that, when cod liver oil freed from Vitamin A by aeration is administered to rachitic animals, the inorganic phosphorous and calcium content of the blood are quickly restored to normal, and the ash content of the bones is increased; and they conclude that these facts are an additional justification for the propriety of speaking of fat soluble vitamins (Vitamin A and Vitamin D) rather than of a fat soluble vitamin, since this finding lends support to the idea that the antirachitic vitamin (Vitamin D) is an entity distinct from Vitamin A.

Similarity of Vitamin D and Radiated Cholesterol.

All recent experimental work indicates that there is the closest analogy between the effects produced by the administration of food substances rich in antirachitic substance or Vitamin D and the effects produced by ultra-violet radiation. Thus, many food substances, inactive so far as Vitamin D is concerned, can be activated by ultra-violet radiation. Thus, M'Cann and M'Kay (4) have shown that inactive linseed oil, casein, flour, and lettuce leaves, can be made as effective as cod liver oil in preventing rickets by rotating them in front of a quartz mercury vapour lamp. Water, fat, starch, sugar, mineral oil, and glycerin, cannot be so activated. Oils retain their acquired antirachitic power for months. Radiated cholesterol makes an extremely active antirachitic substance, and possibly in all foodstuffs shown to be activated by radiation this is the activated body. The compounds in plants capable of being activated and so corresponding to the cholesterol in animal tissues are probably the phytosterols.

So close is the similarity of the effects produced by a diet originally rich in Vitamin D or activated by irradiation, and the effect produced by the radiation of an animal itself on a rachitogenic diet, that it is extremely tempting to assume that, in radiating an anmial, the cholesterol in the skin is activated, and, on absorption, produces the profound effect on phosphorous and calcium metabolism which is associated with the administration of food substances rich in Vitamin D. How these biological effects are produced is entirely a matter of conjecture. The profound effect of the administration of foods containing Vitamin D, or of the effects of ultra-violet rays on bioplasm, are only beginning to be appreciated, but the work done is sufficient to indicate the complexity of the energy transformations that are induced by the absorption of ultra-violet rays by living cells.

It has recently been shown by Hess, Weinstock, and Sherman (5) that activated cholesterol can be separated into a digitonin-precipitable fraction and non-precipitable fraction, and that rats receiving the digitonin-precipitable fraction showed no subsequent healing of the rachitic process, while those that received the non-precipitable fraction gave evidence of marked healing within the experimental period of nine days. The active fraction constituted only about 4 to 5 per cent. of the original amount of cholesterol which had been irradiated for a period of one half-hour at a distance of one foot.

As Hess, Weinstock, and Sherman point out, these experiments are of interest, and provide a method of concentrating activated cholesterol, as well as indicating that only a small part (approximately 5 per cent.) of activated cholesterol possesses antirachitic properties. Its greater interest, at the present time, would seem to lie in the fact that the result links the specific antirachitic power of activated cholesterol with that of cod liver oil. As is well known, the antirachitic potency of cod liver oil has been found to be due entirely to its non-saponifiable fraction. Furthermore, it has been shown by Dubin and Funk (6) that this fraction can be rendered still more potent by means of "eliminating the cholesterol" by precipitation with dignitonin. Coupling these fractionisation experiments of cod liver oil and of activated cholesterol, we have good evidence to the effect that a close chemical similarity exists between the active principle of these two substances, and that their protective and curative action in rickets is due to a factor common to both. Probably the activity of cod liver oil is to be ultimately ascribed to ultra-violet radiation either directly of the cod itself, or more probably, indirectly through the food.

In the Journal of the American Medical Association of 17th April, 1926, reference is made to the standard for medicinal cod liver oil laid down by the Council on Pharmacy and Chemistry of the American Medical Association. According to this standard, medicinal cod liver oil is required to have a content of Fat Soluble Vitamin A, determined by the method of the United States Pharmacopeia, equivalent to 440 units per gram (one unit being the amount required to correct both the induced xerophthalmia and retarded growth of young albino rats), and an anti-rachitic potency when determined by the method of M'Collum, Simmonds, Shipley, and Park (J. Biol. Chem. 51:41, Mar., 1922), of not less than 59 units per gram (one unit being the amount of cod liver oil required daily to initiate recalcification in the leg bones of young albino rats).

The Growth-producing Substance Fat Soluble A (Vitamin A) and the Antirachitic Substance (Vitamin D).

The results of recent experimental work on Vitamin A and Vitamin D, which goes to prove that the growth-producing substance (Vitamin A) is distinct from the antirachitic substance (Vitamin D), have been reviewed, and attention has been directed to the remarkable similarity of Vitamin D and the digitonin non-precipitable fraction of radiated cholesterol.

High Energy Chemistry and Vitamins.

The work of Baly (7) on the high energy chemical reactions which occur in response to ultra-violet radiation has been reviewed, and his conclusion that the chemistry of life is high energy chemistry has been noted.

Need for Devising a Measure of the Vitamin A and Vitamin D Content of Cod Liver Oil.

It has been pointed out that it is of great importance that cod liver oil which is to be used for therapeutic purposes should have a high Vitamin A and Vitamin D content, and that some simple method of measuring this vitamin content should be made available.

Devitalisation of Cod Liver Oil.

The need for measuring the Vitamin A and Vitamin D content of cod liver oil has been emphasised since it has been ascertained that the medicinal oil at present on the market might be devitalised either intentionally or as a result of refining processes. In recent manufacturing processes, methods have been adopted for the extraction of antirachitic substances from cod liver oil, and for refining crude cod liver oil which formerly could only be

used for lubricating purposes; and there is reason to believe that the devitalised oil, after the extraction of the antirachitic substance and refined lubricating oils, may be placed on the market as medicinal oils.

Rickets Production in Rats—Biological Experiments to Measure Vitamin A and Vitamin D Content of Cod Liver Oil.

Experiments on many series of rachitic rats fed on M'Collum's rachitogenic diet No. 3,143 (8), have shown that, when cod liver oil was added to the rachitogenic diet, the rats maintained their weight or increased in weight, the percentage of calcium and cholesterol in the blood increased, and the rickets was cured on the average in three weeks' time.

Experiments on further series of rachitic rats fed on the rachitogenic diet have shown that, when the extract of the antirachitic substance of cod liver oil in the form of ostelin was added to the rachitogenic diet, the rats lost on an average 1·8 grams in weight weekly, the increase in the percentage of calcium and cholesterol in the blood was considerable, but was less than in rats receiving the whole cod liver oil, and the rickets was cured on an average in two weeks' time.

Results somewhat similar but less consistent were obtained with rachitic rats fed on the rachitogenic diet, without the addition of ostelin or cod liver oil, but in which either the food or the rats themselves were irradiated.

In many series of experiments with rachitic rats on the rachitogenic diet, to which was added devitalised cod liver oil (devitalised by the extraction of the antirachitic substance), all the rats died in from two to three weeks.

In other words, it has been proved that rickets can be regularly produced in rats by feeding them on a rachitogenic diet and that rickets in rats can be prevented or, if developed, cured by addition to the rachitogenic diet of antirachitic substance (Vitamin D), or by the irradiation of the rats themselves or of the rachitogenic diet with ultra-violet rays. An increasing mass of clinical evidence is being obtained which goes to corroborate the view that the same factors which prevent, produce, and cure rickets in rats prevent, produce, and cure rickets in children.

The Chemical Test for Vitamin A.

The colorimetric test of Rosenheim and Drummond (9) for Vitamin A has been used to determine the Vitamin A content of various fish oils, of ostelin, and of M'Collum's rachitogenic diet. It has been found, on the one hand, that the Vitamin A content of medicinal cod liver oil made from fresh livers and of technical or crude cod liver oil, is high, the coloration obtained in the arsenic chloride test being equal to 0·5 c.c. of the standard solution of crystal violet and methylene blue diluted to 1 c.c. The Vitamin A content of the devitalised cod liver oil, on the other hand, is found to be low, the coloration being equal to 0·05 c.c. of the standard solution diluted to 1 c.c. So far as the Vitamin A content of whale oil, ostelin, and the radiated rachitogenic diet is concerned, this was found to be nil, as estimated by this colorimetric test.

Deductions from Biological and Chemical Tests for Vitamins.

The biological and chemical experiments indicate that cod liver oil contains both Vitamin A and Vitamin D, and that ostelin contains Vitamin D in a highly concentrated form, but is practically destitute of Vitamin A.

The curative effect of cod liver oil and of ostelin when added to the rachitogenic diet of rachitic rats can be used as a measure of the activated content of these preparations as a routine procedure.

The experiments further indicate that, while the biological method of investigation provides a ready measure of the antirachitic or Vitamin D content of a foodstuff, the biological method of investigation measures less distinctly the growth-producing or Vitamin A factor in a foodstuff. It is fortunate, therefore, that the arsenic chloride colorimetric test for measuring the quantity of Vitamin A is available. In ease of application and reliability of results, this colorimetric test greatly exceeds in usefulness the biological test.

Chemical Examination of the Blood in Rickets.

The chemical examination of the blood in rickets is concerned with the estimation of its cholesterol, phosphate, and calcium content.

It has been found possible to estimate the cholesterol and calcium content of the blood by using about 0·25 gram blood for cholesterol and 0·75 gram blood serum for calcium, and that as thus modified the chemical examination of the blood can be undertaken as a routine in the diagnosis of rickets in children.

It is common knowledge that the views of clinicians differ widely in regard to what is to be defined as early rickets, and, accordingly, if figures of the incidence of active rickets in various cities are to be used for purposes of comparison, then there are only two measures of the rachitic condition that are capable of such comparison—(*a*) the calcium and phosphorus content of the blood, and (*b*) the X-ray appearances.

The normal calcium content of the blood is from 9 to 11 milligrams per 100 c.c., the normal cholesterol content is 100 to 150 milligrams per 100 c.c., and the normal phosphate content is 3 milligrams per 100 c.c.; and variations below these normals can be taken as indicative of rickets.

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V.—*OUTBREAK OF MILK-BORNE GAERTNER ENTERITIS.

An epidemic of enteritis due to infection of milk with a Flexner type dysentery bacillus, causing over 1,000 cases and 72 deaths, occurred in Aberdeen in 1919, and has previously been recorded in the *Journal of Hygiene* (1). Another milk-borne outbreak of enteritis, causing 110 cases and no deaths, occurred in 1923, and has similarly been recorded (2). The cause of this outbreak was not determined, but was assumed to be due to a living bacillus of unrecognised type. In July, 1925, there occurred a further extensive outbreak of enteritis, which has been proved to be due to infection of milk with *Bacillus enteritidis* Gaertner, and as the infection has been proved to be of bovine origin, the Gaertner bacillus having been isolated from the udder and flesh of the diseased cow, as well as from the infective milk, it appears advisable to record the outbreak in considerable detail.

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*Kinloch, Smith, and Taylor, *Journal of Hygiene*, Vol. XXV., No. 4, 30th November, 1926.

Epidemiology.

On July 7th, 1925, it became evident that a widespread outbreak of acute enteritis had developed suddenly in Aberdeen, the first of the cases developing in the early hours of the morning. An increasing number of cases continued to be reported during the 8th July, and thereafter the outbreak terminated.

In all, 497 persons were ascertained to have suffered from the enteritis, 158 cases having occurred on 7th July and 339 on 8th July. Of the 497 persons who contracted the enteritis, 262 were males and 235 females—that is, 53 per cent. males to 47 per cent. females. As to age incidence, 2 per cent. of the patients were under 2 years of age; 6 per cent. 2-5 years; 15 per cent. 5-15 years; 23 per cent. 15-25 years; 28 per cent. 25-45 years; 21 per cent. 45-65 years; and 5 per cent. 65 years and over.

There was no evidence that any of the 497 cases were due to contact infection, the infection in each household having obviously a common source, and the absence of contact infection was further indicated by the fact that not a single case of enteritis originating after the 8th July was discovered.

Incubation Period.—Detailed investigation revealed the fact that the incubation period of the enteritis varied from 2 to 48 hours, the average incubation period being 19 hours.

Symptoms.—The symptoms in all the cases were remarkably uniform, varying only in degree of severity, and presenting the classical features of a Gaertner enteritis. The symptoms were ushered in with headache, nausea, shivering, and epigastric pain associated with rapid rise of temperature to a maximum of 103 or 104° F., with pulse and respiration rates in the region of 130 and 30 respectively. Two typical temperature charts are as follows:—

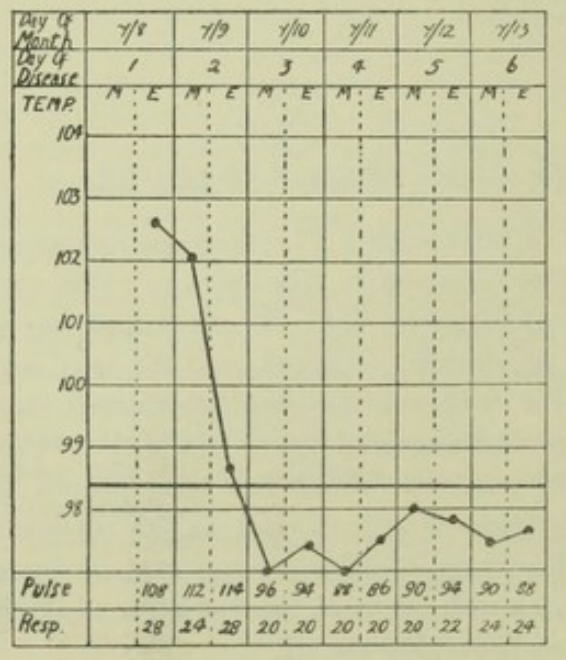

Chart I.—Milk poisoning due to *Bacillus enteritidis* of Gaertner, 1925. *Case*—M. M. (female).

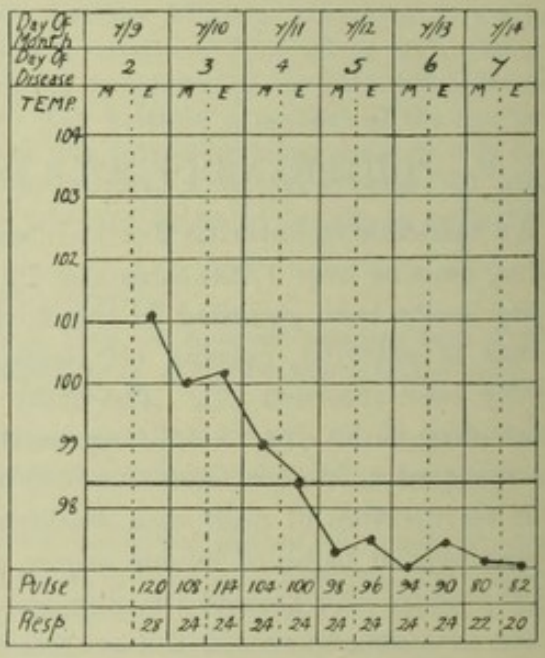

Chart II.—Milk poisoning due to *Bacillus enteritidis* of Gaertner, 1925. *Case*—J. L. (female).

The increasing nausea rapidly culminated in the almost simultaneous onset of vomiting and diarrhœa, associated with much abdominal pain and cramp in the back of the legs and in the lumbar region. The vomiting and diarrhœa rapidly became of an urgent description, the patients "going at both ends" either time about or both together, and with but brief intermissions. The more acute cases passed two or three loose green stools containing much mucus, but no blood, every hour during the first day of illness. In this condition the patients lay in bed, with anxious expression, thickly furred tongue, offensive breath, and congested fauces. The headache and nausea were continuous. In the intervals of vomiting and diarrhœa the slightly tumid abdomen was tender to palpation over the two upper quadrants.

The duration of illness was remarkably uniform in all the cases, the acute symptoms having an average duration of forty-eight hours. During the first day the symptoms were of the urgent nature indicated, and during the second day the high temperature and pulse rate declined, coincident with the gradual cessation of vomiting and a diminution of the diarrhœa. By the third day the acute symptoms had subsided, temperature and pulse were normal, vomiting and diarrhœa had ceased, and the only symptoms complained of were those of weakness and epigastric pain. At this stage the patients appeared worn out, they had no desire for food, which appeared to increase abdominal discomfort, and the desire for rest without interruption was obvious. Complete recovery took place rapidly, the patients being ready for discharge from hospital within five days of the onset of illness. No cutaneous rashes, meningeal symptoms, ocular or other paresis appeared in any of the cases. In the mildest cases, nausea, abdominal discomfort, and slight diarrhœa were the only symptoms.

Treatment.—In the absence of a specific therapy the treatment was symptomatic, and consisted mainly of nursing devices. The elimination of the Gaertner bacillus and its toxins was accelerated by the administration of sodium sulphate, 2 drachms two-hourly, and water was given in great abundance to facilitate vomiting and relieve dehydration.

Mortality.—Only one death occurred in an invalid aged 85 years. All the other patients were completely recovered within a week.

Milk Infection.—On first inquiry it was not clear that milk was the vehicle of infection, since it was early ascertained that the milk supply to the infected families was being obtained from four apparently separate sources. Further inquiry revealed the fact that one of the four dairymen supplying the milk retailed 35 gallons of milk direct from his farm in the vicinity of the City, the milk being that of a herd of 21 cows, and that this farmer was supplying the other three retail dairymen whose milk supplies were also implicated with 7 gallons, 8 gallons, and 16 gallons of milk respectively. These three retail dairymen were receiving milk from other and separate sources, but it was ascertained that only the milk

from the farm in question caused the poisoning. Fortunately, these dairymen retailed the different milk consignments separately and without bulking the milk. No other food was common to the infected households. Lists of all customers supplied by the farmer and by the three retail dairymen were obtained and all were visited, and it was ascertained that a total of 1,016 persons were consuming the milk, although only 497 of these persons contracted the enteritis. Detailed investigation revealed the fact that the milk that caused the enteritis was the mid-day and evening milk of Monday, 6th July.

As regards the source of infection at the farm, it was ascertained that a cow suffering from induration of the udder had been removed from the dairy herd and isolated in a field a week prior to the onset of the enteritis in the City, and that the milk was stripped daily from this cow by the farmer, who also bulked the milk of the herd, although he did not take part in the actual milking. Unknown to the Health Department, this ailing cow, which had developed symptoms of septicæmia, was slaughtered on the day following the outbreak of the enteritis, but later in the day the carcase was seized by the City Veterinary Inspector and condemned as unfit for human food. This action revealed the source of the carcase, and specimens of the udder and flesh of the cow were accordingly made available for bacteriological examination.

It having been ascertained that the milk from this farm was the source of the infection, the remaining twenty cows of the herd were examined by the City Veterinary Inspector on the day the ailing cow was slaughtered, and all the cows appeared to be in good condition. In the absence of any symptoms of illness in the cows, the Veterinary Inspector proceeded to obtain specimens of milk, blood, and fæces from all the cows for bacteriological examination.

On the evening of the day of the outbreak of the enteritis in the City, the source of infection had been traced to the farm, and it was found on inquiry that the farmer and his family, nine individuals in all, were wholly responsible for the production of the milk. All the nine individuals were found to be in good health, and no history of recent enteritis could be elicited. In this connection, however, it is important to indicate that it is our experience in investigating this and similar outbreaks of milk-borne disease that the sense of personal responsibility on the part of the farmer and his financial concern are such that he immediately adopts a policy of reticence which defeats the object of the inquiry. In this connection an educational campaign among dairymen is an urgent requirement, with a view to making them appreciate the fact that *Salmonella* milk infections are liable to occur even in a well-conducted dairy, and that within certain limits the dairyman cannot be censured. In the absence of any evidence of infection in the nine individuals concerned in the production of the infected milk, specimens of blood and fæces from each of the individuals were obtained for laboratory examination.

The widespread nature of the enteritis having made the milk supply suspect from the first, it was possible to obtain three separate samples of the infective milk for bacteriological examination from the houses of patients suffering from

the enteritis. One such specimen was obtained from a household in which the milk had been partaken of for supper on the 6th July, after which the family retired to bed, and the onset of the enteritis had prevented the supper-table being cleared in the morning. In two other households of railwaymen on the night shift, the milk was taken with porridge at 8 a.m. and 11 a.m. respectively on 7th July, and was still on the table and so available for bacteriological examination some 11 hours later, when the onset of enteritis in the two families instigated an appeal to the Health Department for assistance.

Hospital Arrangements.—With a view to the intensive clinical and bacteriological investigation of the enteritis and in order to provide nursing services in cases of urgent necessity, sixteen cases were admitted to hospital.

Specimens for Laboratory Examination.—The following specimens for laboratory examination were obtained:—

(a) Material obtained from Enteritis Cases—

25 samples of fæces from patients in the height of the enteritis.

6 samples of vomit.

10 samples of fæces from convalescent cases of enteritis.

3 specimens of blood for blood culture from patients early in the acute stage of the enteritis.

21 samples of blood from enteritis cases in the tenth day of illness (for purposes of agglutination tests).

(b) Material obtained from Source of Infection—

3 samples of the infective milk from the homes of persons who suffered from the enteritis.

Samples of blood from each of the nine members of the farmer's family (for the purpose of testing for the presence of agglutinins).

Samples of fæces from each of the nine members of the farmer's family.

Samples of milk from each of the twenty cows in the dairy herd.

Samples of blood from each of the twenty cows in the dairy herd.

Samples of fæces from each of the twenty cows in the dairy herd.

A piece of the udder of the ailing cow which had been slaughtered.

A piece of the flesh of the ailing cow which had been slaughtered.

Preventive Measures.—In consultation with the County Medical Officer of Health, all milk from the farm was stopped as from Wednesday forenoon, 8th July, since no practicable means were available for pasteurising the milk. This embargo was raised on Monday, 13th July, when the laboratory investigation had failed to produce evidence of a carrier condition in any of the milkers or in the cows. Later examination of the detailed evidence showed that the only infected consignments of milk were those of the mid-day and evening milkings of 6th July, and that food poisoning from this source thereafter ceased.

Bacteriological Investigation.

A. *Specimens obtained from Patients.*—Within a few hours of the onset of the outbreak specimens were received at the Laboratory. Twenty-five specimens of fæces were obtained from individual patients, and sixteen of these showed numerous colonies of a non-lactose fermenting organism when plated on M'Conkey's medium. Six samples of vomit were obtained, and two of these yielded practically pure cultures of the same type of organism. Ten specimens of fæces were later obtained from the same patients after a period of forty-eight hours, but the non-lactose fermenting types had entirely disappeared.

The organisms obtained from the fæces and vomit producing the typical reactions of the paratyphoid group on the initial sugars were actively motile, and were agglutinated to the full titre of a Gaertner Serum (1 in 2,000) and not at all by a 1 in 50 dilution of sera prepared from *B. paratyphosus* A, *B. paratyphosus* B Schottmuller, B. Aertrycke Mutton, and from *Salmonella* Type Newport. Later many strains of the organism were tested on an extended series of sugars, and the following reactions were obtained after a ten days' period of incubation—neither acid nor gas were produced in lactose, salicin, saccharose, inosite, and raffinose, while acid and gas were produced in glucose, mannite, dulcite, sorbite, trehalose, rhamnose, maltose, xylose, and arabinose; milk showed slight acidity at first, but this was followed by a definite alkaline reaction. Blackening of lead acetate medium rapidly occurred, and no indol production could be detected in peptone water.

Absorption of agglutinin tests showed that the isolated strains had the power to completely absorb the agglutinins from a Gaertner serum and the stock B. enteritidis Gaertner strain completely removed the agglutinins from a serum prepared against one of the strains isolated from the fæces of a patient.

In order to facilitate the investigation of the outbreak, sixteen of the more severely ill cases were admitted to Hospital. Blood cultures obtained from three of these cases in the acute stage remained sterile and the blood serum gave no agglutination against the stock strain at this period. After an interval of from seven to ten days the sera from eighteen individuals, including further specimens from the three cases from whom blood serum had already been obtained, were tested against formalised broth cultures of *B. paratyphosus* B, *B. enteritidis* Gaertner (stock strain), the Causative strain, and the whole of the types of food poisoning group as classified by Schutze (3). The actual strains had been previously obtained from the National Collection of Type Cultures. With the exception of five sera, agglutination was only obtained against *B. enteritidis* Gaertner (stock strain), and *B. enteritidis* Gaertner (causative strain) in dilution varying from 1 in 50 to 1 in 800, the agglutination titres against the stock strain being consistently lower than those obtained against the causative strain.

In five cases, however, various agglutination reactions were obtained as set forth in the following table:—

Strains.	Agglutination titres of cases.				
	No. 2.	No. 4.	No 6.	No. 8.	No. 13.
B. paratyphosus B Schottmuller . .	100	25	0	0	100
B. enteritidis Gaertner (Stock) . .	50	50	200	200	50
B. enteritidis Gaertner (Causative) . .	100	100	400	800	50
Salmonella Type Stanley	50	50	0	0	100
Salmonella Type Reading	25	50	0	25	100
Salmonella Type Newport	50	25	0	0	50
Salmonella Type Aertrycke (Mutton) .	25	50	100	50	100
Salmonella Type Binns	25	50	0	0	50
Salmonella Type Hirschfeld . . .	0	100	25	0	50
Salmonella Type Arkansas . . .	0	100	50	50	25
Salmonella Type G	0	50	0	0	25

Previous inoculation with T.A.B. vaccine might have accounted for the presence of various agglutinins in three cases, but no history of previous inoculation or enteritis could be obtained from the other two. As a control to these observations, ten sera were obtained from normal individuals and tested against the same suspensions of the various organisms. One serum only was found to agglutinate all the types of the food poisoning group in a dilution of 1 in 50 with the exception of Type G and *B. enteritidis* Gaertner. Five of the patients' sera which gave high agglutination titres were absorbed with emulsions of both strains of *B. enteritidis* Gaertner. The agglutinins were completely removed.

The pathogenity of a strain for various animals was tested. Intraperitoneal inoculation of three guinea-pigs and three mice with a living emulsion caused death in twenty-four to seventy-two hours. Six white rats, two rabbits, six guinea-pigs, and twelve white mice were fed with emulsions of the organisms. The rabbits and white rats remained unaffected, but all the mice died at varying periods from forty-eight hours to fourteen days after feeding, and the guinea-pigs died within a fortnight. *B. enteritidis* Gaertner was recovered *post-mortem* from the blood and various organs of these animals.

B. *Investigation of the Sources of Infection.*—As it was evident that milk was the only common food consumed by the patients, every endeavour was made to obtain samples of the infecting milk. Three such samples were obtained in the homes of certain patients and from all three specimens numerous colonies of *B. enteritidis* Gaertner were isolated. At the farm from which the milk was supplied a thorough bacteriological investigation of the farmer's whole family and his dairy cows was made. Blood was obtained from nine members of the family and tested against the formalised emulsion of the various types of the food poisoning group. Agglutination was obtained only against both strains (stock and causative) of *B. enteritidis* Gaertner by two of the sera. The serum from the farmer himself agglutinated both strains in a dilution of 1 in 25, while the serum from a daughter aged 12 years agglutinated both strains in a dilution of 1 in 100. The fæces from the nine members of the family were examined, but no Gaertner bacilli were obtained.

One sample of milk and two specimens of fæces from each of the twenty cows in the herd were examined without definite result. It was then ascertained that a cow which had been ailing for a week had been sent to be slaughtered. The carcase was condemned and from the flesh and mammary gland of the animal (every precaution being taken to avoid external contamination) scanty colonies of a non-lactose fermenting organism were obtained. These strains were found to give sugar, agglutination and absorption reactions, identical in every way to those of the stock strain of *B. enteritidis* and to the strains of the organism isolated from the patients and the milk. A sample of blood from each of the cows in the herd was now obtained and the serum was tested for agglutinins against the emulsions of the various types of organism. The results are set forth in the following table, the lowest dilution of the serum tested being 1 in 50.

Organisms.

Cow No.	B. enteritidis Gaertner (Stock).	B. enteritidis Gaertner (causative).	Salmonella Type Stanley.	Salmonella Type Reading.	Salmonella Type Newport.	Salmonella Type Aertrycke (Mutton).	Salmonella Type Binns.	Salmonella Type Hirschfeld.	Salmonella Type Arkansas.	Salmonella Type G.	B. paratyphosus B Schottmuller	B. paratyphosus A.	B. typhosus.
1	0	0	0	0	50	0	0	50	50	100	50	0	0
2	0	50	100	0	0	0	0	0	50	0	0	0	100
3	0	50	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	50	50	0	50	50	50	50	0	0	200	0	0
6	0	0	50	50	50	50	0	100	50	100	100	0	0
7	0	0	0	50	0	50	0	0	50	100	0	0	50
8	0	100	100	100	200	200	100	200	200	100	200	0	0
9	0	50	50	0	0	0	0	0	50	0	0	0	50
10	0	0	0	0	50	0	0	0	50	0	0	0	0
11	0	0	0	0	50	0	0	0	100	0	0	0	50
12	100	50	50	100	50	50	0	50	50	50	50	0	100
13	100	400	50	50	0	50	0	0	50	0	50	0	100
14	0	100	0	0	0	0	0	0	0	0	0	0	0
15	50	50	200	0	50	50	0	0	50	0	50	0	100
16	50	100	100	50	50	50	0	50	100	0	50	0	100
17	0	0	0	0	50	0	0	0	100	0	50	0	50
18	0	50	50	50	50	50	0	0	200	0	50	0	50
19	100	50	50	0	0	0	0	0	100	0	0	0	50
20	0	50	50	50	50	0	0	0	100	0	0	0	50

The examination of the sera from the cows was therefore of very indefinite value, and the conclusion to be drawn was either that normal agglutinins were present in the sera of many cows in fairly high dilutions, or that certain of these animals suffer at some time or other from infections due to the organisms of the typhoid-paratyphoid group.

Blood was now obtained from twenty heifers and bullocks of various ages on being slaughtered, these animals having been chosen at random and having no connection with the infected farm, and the serological results obtained are as follows:—

Organisms.

Bullock No.	B. enteritidis Gaertner (Stock).	B. enteritidis Gaertner (Causative).	Salmonella Type Stanley.	Salmonella Type Reading.	Salmonella Type Newport.	Salmonella Type Aertrycke (Mutton).	Salmonella Type Binns.	Salmonella Type Hirschfeld.	Salmonella Type Arkansas.	Salmonella Type G.	B. paratyphosus B. Schottmuller.	B. paratyphosus A.	B. typhosus.
1	0	0	0	50	0	0	0	0	0	0	0	0	100
2	0	0	100	0	0	0	0	0	0	0	0	0	100
3	0	0	50	0	50	50	0	200	50	0	50	0	50
4	0	0	0	0	0	50	0	100	0	0	0	0	0
5	400	0	0	0	0	0	0	100	0	0	0	0	50
6	0	0	0	0	0	0	0	50	50	0	0	0	0
7	100	100	0	0	50	0	0	100	50	0	0	0	0
8	0	0	0	50	100	100	100	100	100	50	50	0	0
9	50	0	50	50	100	100	100	100	100	0	50	0	50
10	50	100	100	100	200	50	100	100	200	50	50	0	0
11	50	0	0	0	0	0	0	0	0	0	0	0	0
12	0	100	0	0	0	0	0	0	200	0	0	0	0
13	0	0	0	0	0	50	0	0	50	0	0	0	0
14	0	0	0	0	0	0	0	0	200	0	0	0	50
15	0	50	0	0	0	50	0	0	0	0	0	0	50
16	0	0	0	0	0	0	0	0	50	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0
19	50	200	100	50	50	50	50	100	400	100	200	0	50
20	0	0	0	0	0	0	0	0	0	0	0	0	0

It will be seen that the reactions obtained from the sera of a random sample of bullocks and heifers are very similar to those obtained from the sera of the cows in the dairy herd under investigation.

Blood samples were next obtained from nine calves varying in age from three to twenty-one days. With these sera no agglutination was obtained against any of the strains in a dilution of 1 in 50. It would thus seem likely that certain of these animals suffer at some period of their lives from infections due to organisms belonging to the typhoid-paratyphoid group.

As a matter of interest, the sera of sheep, pigs, wild rats, wild mice, and guinea-pigs were then investigated, and the results obtained are given in the following tables:—

Serological Reactions obtained from the Sera of Sheep.

Sheep No.	B. enteritidis Gaertner.	Salmonella Type Stanley.	Salmonella Type Reading.	Salmonella Type Newport.	Salmonella Type Aertrycke (Mutton).	Salmonella Type Binns.	Salmonella Type Hirschfeld.	Salmonella Type Arkansas.	Salmonella Type G.	B. paratyphosus B. Schottmuller.	B. paratyphosus A.	B. typhosus.
1	0	0	0	0	0	0	0	400	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	50	0	0	100	0	0	0	0
4	50	0	0	0	0	0	0	0	0	0	0	0
5	50	50	100	0	50	0	0	400	0	0	0	0
6	0	400	0	0	0	0	0	0	0	0	0	400
7	0	50	0	0	0	0	0	100	0	0	0	200
8	0	0	0	0	0	0	0	50	0	0	0	0
9	0	0	0	0	0	0	0	100	0	0	0	0
10	50	0	0	0	0	0	0	100	0	0	0	0
11	50	0	50	0	0	0	0	100	0	0	0	0
12	50	50	0	0	0	0	0	100	0	0	0	50

Serological Reactions obtained from the Sera of Pigs.
Lowest dilution used, 1 in 50.

Pig No.	B. enteritidis Gaertner.	Salmonella Type Stanley.	Salmonella Type Reading.	Salmonella Type Newport.	Salmonella Type Aertrycke (Mutton).	Salmonella Type Binns.	Salmonella Type Hirschfeld.	Salmonella Type Arkansas.	Salmonella Type G.	E. paratyphosus B. Schottmuller.	E. paratyphosus A.	B. typhosus.
1	50	0	0	0	0	0	100	0	0	0	0	50
2	0	0	0	0	0	0	100	0	0	0	0	0
3	50	0	0	0	0	0	100	0	0	0	0	0
4	50	100	100	100	100	100	100	100	50	100	0	100
5	100	0	0	0	0	0	0	50	0	0	0	100
6	0	50	50	50	50	50	0	0	0	0	0	100
7	50	0	0	0	0	0	0	0	0	0	0	0
8	50	50	0	50	0	0	0	50	0	0	0	50
9	50	0	0	0	0	0	0	50	0	0	0	0
10	50	50	0	50	0	0	0	0	50	50	0	0
11	100	50	50	50	50	50	50	100	0	0	0	50
12	50	50	0	0	0	0	0	0	0	0	0	0

The blood sera from twelve rats were next examined, and one specimen only agglutinated two strains—Type Stanley and *B. typhosus* in a dilution of 1 in 100. The sera from ten wild mice and from ten guinea-pigs did not produce agglutination, the lowest titre of the sera from the mice being 1 in 50 and from guinea-pigs 1 in 10.

In addition, the fæces from twelve sheep, twelve pigs, twelve rats, ten mice, and ten guinea-pigs were examined for organisms of the paratyphoid group. Only one specimen from a rat gave an organism which, culturally and serologically, gave the typical reactions of B. enteritidis Gaertner.

Discussion.

It has been shown that the 497 cases of enteritis occurring in Aberdeen in July, 1925, were caused by the *B. enteritidis* Gaertner, which was isolated from (*a*) the vomited material and fæces of patients suffering from the enteritis, (*b*) the infective milk as obtained from three households infected with the enteritis, and (*c*) the udder and flesh of a cow from the dairy herd producing the milk, the cow having suffered from induration of the udder and later a septicæmia.

It might be suggested that a human carrier transmitted the infection, since the blood serum of the farmer agglutinated both strains (stock and causative) of *B. enteritidis* Gaertner in a dilution of 1 in 25, and the serum of his youngest daughter, aged 12 years, agglutinated both strains in a dilution of 1 in 100. As opposed to this view, it is to be noted that on occasion Gaertner agglutinins in as high a dilution as 1 in 100 may be found in the blood serum of apparently normal individuals, that there were no symptoms or history of enteritis in the farmer and his daughter, and that the examination of their fæces was negative. In these circumstances the positive finding of *B. enteritidis* in the udder and flesh of the septicæmic cow and in the infective milk warrants the conclusion that the septicæmic cow was the essential source of the infection.

The fact that the source of this milk-borne Gaertner enteritis has been traced back to an infected cow gives support to the hypothesis originally put forward by Savage to the effect that the Gaertner-caused food-poisoning outbreaks are due to infection of food with virulent Gaertner group organisms derived either from animals which are at the time suffering from disease due to Gaertner group bacilli, or from animals acting as carriers of these bacilli. The common view that the Gaertner infections are often spread by human carriers has no foundation in fact. Reference to the literature of *Salmonella* food-poisoning shows that in only three outbreaks in this country has any evidence been obtained indicating a human source of the infection, viz., in the Wrexham outbreak (1910), the Brighton outbreak (1917), and in the Dublin outbreak (1921). The matter is fully discussed by Savage and Bruce White in the M.R.C. *Special Reports*, Nos. 91 and 92 (4).

The negligible mortality of this Aberdeen outbreak of milk-borne Gaertner enteritis as contrasted with the high mortality of the Aberdeen milk-borne Flexner dysentery outbreak in 1919 is noteworthy, and is in accord with the findings of Savage and Bruce White.

The presence of agglutinins of the typhoid-paratyphoid group in the sera of bovines, sheep, and pigs, and their absence in young calves, would appear to indicate that these animals either obtain immunity by reason of the absorption of non-infective doses of such bacilli, or that at some period of their lives they suffer from infections due to organisms belonging to the typhoid-paratyphoid group. Since the available evidence is against the view that cattle commonly harbour *Salmonella* organisms in their intestines, the elucidation of the causes of the development of these agglutinins in cattle and other animals may provide fresh information as to the manner in which *Salmonella* infections are transmitted from

lower animals to man, and may eventually show that *Salmonella* infections are essentially and primarily diseases of lower animals occurring only secondarily in man.

References.

1. Kinloch, J. P. (1923). *Journal of Hygiene* XXI., 451.
2. Anderson, J. S., Kinloch, J. P., and Smith, J. (1923). *Ibid.* XXII., 89.
3. Schütze, H. (1920). *Lancet* CXCVIII., 93.
4. Savage, W. G., and Bruce White, P. (1925). *Medical Research Council Special Reports*, Nos. 91 and 92.

VI.—*PARATYPHOID FEVER AND AERTRYCKE ENTERITIS IN ABERDEEN—A CONTRAST.

In the *Medical Research Council's Special Reports* Nos. 91 and 92, and in the *Journal of Hygiene*, Vol. XIV., No. 1, July, 1925, W. G. Savage and P. Bruce White stress the desirability of restricting the term "*B. paratyphosus* B" to the organism of paratyphoid fever and nothing else, and of designating the organism that most commonly causes food-poisoning outbreaks as *B. aertrycke*, and not as *B. paratyphosus* B (type *aertrycke*). In view of the fact that the features of a paratyphoid fever outbreak due to infected ice-cream, and of an *aertrycke* enteritis due to infected pork as occurring in Aberdeen in 1925 emphasise the distinction between paratyphoid fever and *aertrycke* enteritis, it has seemed well to record these two outbreaks in some detail for the purpose of contrasting them the one with the other and with the milk-borne Gaertner enteritis which is recorded in the preceding paper.

Outbreak of Paratyphoid Fever Due to Infected Ice-Cream.

An outbreak of paratyphoid fever due to *B. paratyphosus* B originated in the Woodside district of Aberdeen during the first week of August, 1925. Subsequent investigation revealed the fact that a total of 21 Aberdeen cases was associated with this outbreak. It was further ascertained that two girls from Glasgow, who had been on holiday in the Woodside district of Aberdeen from 17th to 30th July, had sickened of paratyphoid fever in Glasgow on the 2nd and 5th August respectively, coincident with the appearance of the Aberdeen cases. In all, therefore, 23 cases connected with the Woodside district of the City had sickened on or about the 4th of August, and had apparently a common source of infection. Five were males and 18 females, the cases being confined to 20 families. The ages of the sufferers varied from 5 to 75 years; 11 were in the 5-15 year age-period; 9, 15 25; 2, 25-45; and one above 65 years.

Symptoms.—The onset in all the cases was characteristically insidious, marked by progressive lassitude and malaise which continued during the first week of illness.

* Bowie, Kinloch, and Smith, *Journal of Hygiene*, Vol. XXV., No. 4, 30th November, 1926.

Headache was a prominent feature, slight at first, but increasing to great severity in some cases, mostly frontal, but also occipital in position. In the worst cases the pain was situated low down on the forehead and behind the eyes, and one patient was unable to tolerate ordinary daylight. Giddiness was present in a few cases, and noises in the ears in others. Loss of appetite was an early symptom, with dry mouth and tongue, considerable thirst, and a feeling of nausea. Vomiting was not a common feature, and, when present, was slight. Pains were experienced in the back and legs, and occasionally in the arms. Quite a large proportion of the cases complained of chilliness and shivering. Abdominal discomfort or pains, with no constant localisation, were common to all—in the majority, more or less continuous, and in a few, spasmodic in nature. Pain in the region of the spleen, occurring towards the end of the first week of illness, was present in a few cases. If anything, constipation was the rule; some cases had mild diarrhœa, while in others there was no disturbance of the bowel. The urine was dark coloured and concentrated. Epistaxis occurred in three cases, and slight deafness, beginning about four days from the onset and lasting three to four days, in two cases. Progressive drowsiness was present in a few, one patient being admitted to hospital as a case of encephalitis lethargica. Nearly all complained of a mild degree of bronchitis lasting a few days. Pain in the throat was a prominent symptom in some of the cases, one patient being sent to hospital as a case of diphtheria. This was apart from another case admitted to the diphtheria ward, in which the diagnosis of diphtheria was confirmed bacteriologically, but which patient was also found, both clinically and serologically, to be suffering from infection with *B. paratyphosus* B. The condition of the patients when admitted to hospital varied from those in whom the disease was still advancing and who were really ill, to those in whom the symptoms had been slight and who were on the point of recovery.

The following may be taken as an example of the gravely ill type of case. The patient, a female, aged 26 years, was admitted on the ninth day of illness. The facial expression was heavy, somewhat anxious, with a slight flush on the cheeks. There was complaint of headache and thirst. The lips were dry and inclined to crack, the tongue thickly furred, brown down the centre, merging into white at the edges and with a red triangular area at the tip, the apex of the triangle being directed backwards. The fauces were moderately congested. Slight cough was present, but nothing gross was found in the lungs. The skin was hot and dry. The abdomen was moderately distended. Rose spots were present in considerable number, not only on the abdomen but also on the chest and flanks. Some of them were surmounted by a minute vesicle. There was a slight tenderness and gurgling in the right iliac fossa, and some tenderness under the right costal margin. A certain amount of muscular resistance to palpation was present on the

whole of the right side of the abdomen, more so than on the left. The spleen was enlarged, and its edge clearly felt about one and a half inches below the ribs, and was slightly tender. Diarrhœa was very troublesome, and stools being of a light brown colour, not typically pea-soup in appearance. The abdominal reflexes were absent. The temperature on admission was 103° F., and was of the continuous type, never varying beyond the limits of 103 and 103·6° F. The pulse was full and rather soft, not dicrotic, and varied from 120 to 128. For a week after admission the temperature remained practically level at 103° F. The pulse became dicrotic, the heart enfeebled, but the bases of the lungs remained clear. The lips were dry and cracked, and the tongue dry and glazed. Slight epistaxis occurred once. The abdomen was not greatly distended but was somewhat tender, especially in the right iliac fossa. Diarrhœa continued and was frequent, and the patient became extremely exhausted and very miserable. She perspired freely, had a tendency to drowsiness, and had incontinence of fæces. There was no delirium. On the sixteenth day the temperature dropped to 102° F., and the pulse to 112 beats per minute. On the eighteenth day, the pulse increased to 120, and the patient had a moderate hæmorrhage, followed by a drop of temperature to 98·4° F. Next day it rose to 103° F. and fell by lysis to normal in six days. This was the most severely ill of all the cases, and was the only one in which hæmorrhage occurred.

The temperature in the other more severe cases was of the remittent type, with a swing of three or more degrees, the high temperature being mainly in the evening. Two typical temperature charts, one of which appertains to the gravely ill type case described, are as follows:—

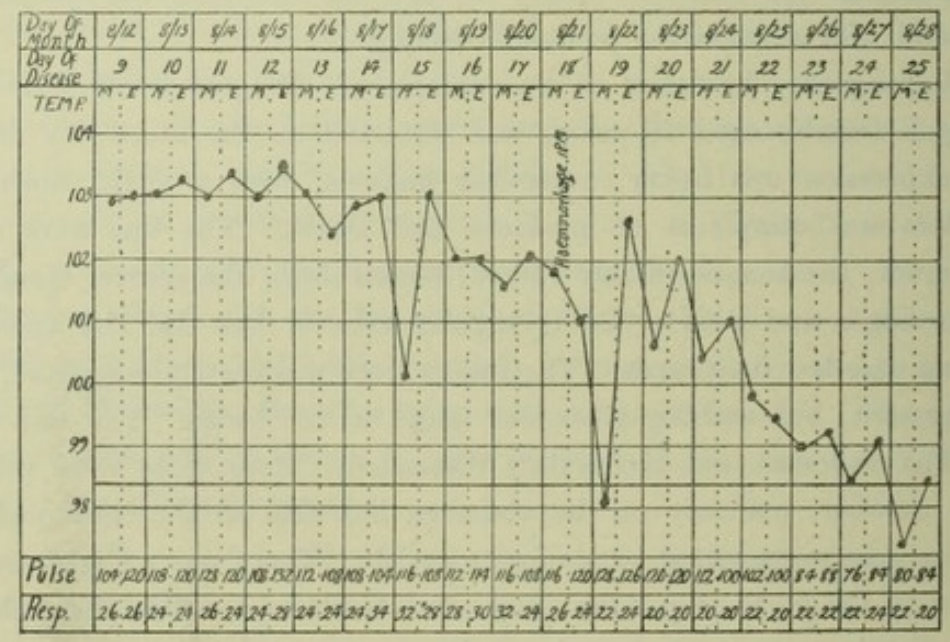

Chart I.—*Paratyphoid* B fever due to infected ice-cream, 1925. *Case*—G. T. (female).

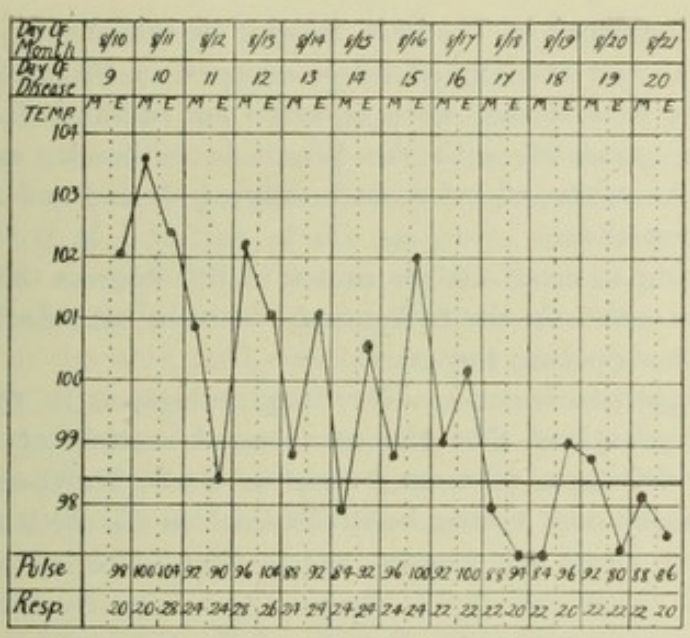

Chart II.—*Paratyphoid* B fever due to infected ice-cream, 1925. *Case*—W. L. (female).

These charts record the temperature of paratyphoid fever patients from the ninth day of illness onwards, and are in marked contrast with the temperature charts of patients suffering from either Gaertner enteritis or *aertrycke* enteritis.

In the other more severe cases the pulse varied from 90 to 120, was full and rather easily compressed, and was without dicrotism. The tongue appearances were as above recorded, and were practically constant. Rose spots were present in most cases, but not all were typical. Moderate distension of the abdomen was frequent, and tenderness most marked in the right iliac region, but also in the gall bladder and splenic areas. Enlargement of the spleen, recognised clinically, was the exception, being present only in three cases. Diarrhœa was not marked. The urine was inclined to be scanty and high coloured. Vomiting was absent. The mild cases exhibited very little beyond the initial symptoms described as occurring during the stage of onset. Perhaps the most constant signs were the appearance of the tongue, rose spots, and slight abdominal tenderness. Abdominal reflexes were absent in about 50 per cent. of the cases. Moderate pyrexia and increased pulse rate for a few days after admission were the main features. A characteristic was the degree of hunger experienced by practically all patients, even those with high temperature, and a liberal light diet was consumed without any untoward effects. A moderate amount of anæmia was present in most cases. Pyuria occurred in four cases, and retention of urine in one case. Defervescence took place in four to seven days by lysis, the morning temperature usually falling more than the evening, while the temperature of convalescence was inclined to be subnormal. The tongue cleaned and appetite increased. Persistence of some tenderness in the region of the cæcum was observed.

Source of Infection.—Previous to 1924, paratyphoid B fever, confirmed bacteriologically, had been absent from Aberdeen for four years, but on 7th May, 1925, a case of paratyphoid fever, confirmed bacteriologically, occurred in Hutcheon Street; on 20th June a case occurred in Louisville Avenue; on

10th July a case occurred in Leadside Road; on 5th August a case occurred in Upper Denburn; and on 9th August a case occurred in Bright Street. These cases, so far as could be determined, were separate and distinct from the 23 cases of paratyphoid fever associated with the Woodside outbreak; and it has not been possible to trace the source of infection in any of these five cases, or to trace any relationship between them.

In endeavouring to ascertain the source of infection in the 23 cases associated with the Woodside outbreak, the milk supply could be excluded, 13 separate dairies being concerned in supplying the cases.

After full inquiry concerning every food substance in the diet of these 23 patients, it was ascertained that the one common article of food consumed was ice-cream, obtained from a particular shop in Great Northern Road, Woodside, the ice-cream in every case having been obtained on the 20th July; and since the cases sickened on or about 4th August, the incubation period of the disease is put at 15 days.

Some of the cases occurred in districts of the City other than Woodside, but all of them had obtained ice-cream at the shop in Great Northern Road on the 20th July; and the same was true of the two cases that sickened in Glasgow, it being revealed in a communication from the Medical Officer of Health of Glasgow that the two Glasgow cases had obtained ice-cream daily from the 17th to the 30th July at the suspected shop.

It was not possible to ascertain how the ice-cream became infected. In the shop in question, about 6 gallons of milk were daily converted into ice-cream, the milk being brought to the boil, corn-flour, &c., added, and the mixture being again brought to the boil. This custard, when cold, was introduced into the refrigerator, which had a capacity of about 3 gallons, and in the freezing process the custard was stirred with a wooden stirrer having a steel scraper at the end. In serving the ice-cream, a wooden spoon was always used, and was kept for that purpose only. In regard to the number of people served daily with ice-cream from the suspected shop, it was estimated that on the average a gallon of ice-cream would be distributed to 60 consumers, so that 6 gallons of ice-cream would supply some 360 consumers.

There is no reason to believe that the milk from which the ice-cream was made was infective. This milk was obtained from one of the largest milk retailers in the City, and there was no evidence of infection of this milk supply.

Similarly, full bacteriological investigation of the workers engaged in preparing and selling the ice-cream had a negative result, as will be shown later. It is true that the shopkeeper had agglutinins in her blood to *B. typhosus* in dilution of 1 in 60, but there were no agglutinins to *B. paratyphosus* B, and there was a history of this individual having had typhoid fever in childhood. Her mother, similarly, had agglutinins in dilution 1 in 30 to *B. typhosus*, but she also had previously suffered from typhoid fever at the same time as her daughter. So also the shopkeeper's son, who worked in the premises, had agglutinins both to *B. typhosus* and *B. paratyphosus* B in dilutions 1 in 60, but while this person had no history of previous illness, he was inoculated against typhoid and paratyphoid fevers in the army in 1917.

It is difficult to explain why only 23 cases of paratyphoid fever occurred, if anything from 2 to 6 gallons of ice-cream, distributed to, say, 120 to 360 people, was infective. Again it is to be noted that ice-cream is of more or less solid consistency, and that the refrigerator temperature would not permit of multiplication of paratyphoid bacilli. Impossible as it has been, however, to ascertain the source and the method of infection of the ice-cream with paratyphoid bacilli, it can, nevertheless, be accepted that the ice-cream consumed on 20th July was infected and caused the 23 cases of paratyphoid fever. This ice-cream obtained on the 20th July was the only food consumed in common by all the 23 patients, who sickened 15 days after consuming it. The natural reticence of a shopkeeper when his goods are suspected of being the source of a food infection, and the time that had elapsed since the food was infective, made it impossible to obtain further information as to how the ice-cream had been handled and disposed of on the day in question.

Bacteriological Investigation.—As regards the 21 City cases, an organism giving the cultural and agglutination reactions of *B. paratyphosus* B was isolated from the blood in three cases, from the fæces in eight cases, and from the urine in two cases. Paratyphoid B agglutinins were found in the bloods of all the cases, varying in dilution from 1 in 60 to 1 in 960, according to the stage and nature of the illness. Later an agglutinating serum was prepared against one strain, and reciprocal absorption tests with the new serum and stock *B. paratyphosus* B strain, and the stock paratyphoid B serum and the causative strain showed that the causative organism was undoubtedly *B. paratyphosus* B.

There were 96 contacts in the infected households, and 88 specimens of fæces and 90 specimens of urine from these contacts were examined for *B. paratyphosus* B with negative results.

Of all the contacts, 3 workers engaged in the public distribution of food and 17 children were kept from work and from school respectively, for a period of three days, until negative bacteriological finding sanctioned their liberation.

As regards the source of infection at the shop supplying the ice-cream, reference has already been made to the bacteriological findings among the workers employed in the shop. Typhoid agglutinins in dilutions 1 in 60 and 1 in 30 were found in the shopkeeper and her mother respectively, and typhoid and paratyphoid B agglutinins in dilutions 1 in 60 were found in the blood of the son, who was also employed in the shop. Samples of blood from the other three employees contained no agglutinins, and the specimens of fæces and urine from all the employees were negative.

Three weeks had elapsed from the time the ice-cream was infective before these investigations were begun. As already stated, the source of infection of the ice-cream has not been determined. It is assumed that a paratyphoid B carrier either directly or indirectly contaminated the ice-cream, and it may be that this undetermined carrier and the other five cases of paratyphoid fever which occurred throughout the City during the preceding three months, and which had no relation to the Woodside outbreak, had a common source of infection; but, as already stated, no epidemiological evidence has been obtained of such relationship between any of these cases.

Outbreak of Aertrycke Enteritis Due to Infected Pork.

An outbreak of meat poisoning, confined, so far as is known, to two households, occurred towards the end of October, 1925. In the first household, which consisted of six members, including a maid-servant, the infected pork, purchased on 26th October, was consumed within 24 hours, by four members of the household, who sickened during the night of 27th-28th October. The incubation period in these four patients averaged 24 hours. In the other household only a maid-servant consumed the infected pork, which also had been purchased on 26th October, and which was consumed on the same day. This maid-servant sickened on Thursday, 29th October, no other member of the household being affected, and in this case the incubation period was 60 hours.

Symptoms.—In practically all the cases the onset of illness was ushered in by sickness, vomiting, diarrhœa, rise of temperature to 102-103° F., severe headache, photophobia (and in one case diplopia), abdominal pain, and pain in the neck and loins.

Two typical temperature charts are as follows:—

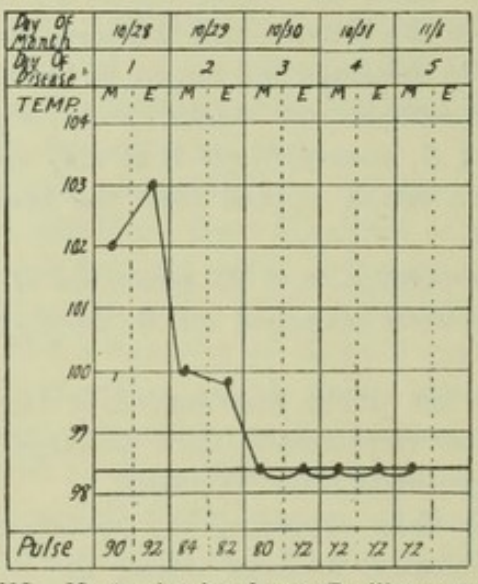

Chart III.—Meat poisoning due to *Bacillus aertrycke*, 1925. *Case*—J. C. (female).

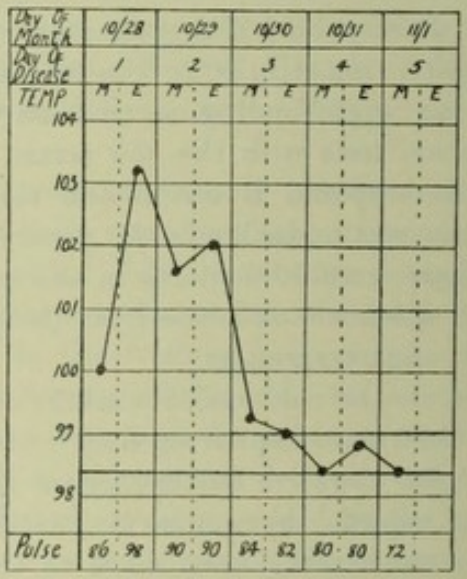

Chart IV.—Meat poisoning due to *Bacillus aertrycke*, 1925. *Case*—C. M'R. (female).

In all cases the abdomen was somewhat distended, and there was tenderness on palpation in both iliac fossæ. The pulse was rapid but regular, the expression anxious, and there was a degree of restlessness, which in one of the cases went on to mild delirium. Diarrhœa of a distressing nature continued for three days, after which recovery took place rapidly.

Source of the Poisoning.—On investigation, it was ascertained that in the household where four out of the six members had suffered from the enteritis, all the members of the household had partaken of the same food, with the exception of the cooked pork, which had been consumed only by the four persons affected.

The pork which caused the enteritis in both households was purchased on Monday, 26th October, and was obtained from a large retail grocery establishment in the City, the pork being cut from a cooked pork roll. It was ascertained

that some four or five of these cooked pork rolls, weighing from 5 to 6 lbs. each, are retailed weekly from the shop in question—the pork being cooked in a factory in Glasgow. On Monday, 26th October, when the pork was apparently infectious, only one roll was sold to the public.

The physician in attendance on the family where the four cases of enteritis developed first notified these cases of food poisoning to the Health Department, and it was this medical practitioner who also directed attention to the case of food poisoning in the maid-servant of the other household. Only half a pound of cooked pork was purchased by each of the households, and it is interesting to note that no further cases of enteritis were put on record, even although it be assumed that the infection was confined to one pork roll weighing 6 lbs.

In the first household, what was left of the pork was given to the cat, and this cat developed severe sickness and diarrhœa of one day's duration some forty-eight hours later.

The maid-servant in the second household consumed about $\frac{1}{4}$ lb. of the pork, and the remaining $\frac{1}{4}$ lb. was available for laboratory examination. This $\frac{1}{4}$ lb. of pork was of good appearance, and showed no signs of undercooking, being of a medium grey colour, and other rolls of pork similarly cooked have, on examination, shown no appearance of undercooking.

In the retail grocery establishment from which the pork was purchased, there are six employees, only two of whom had access to the pork in question, and all of these employees appeared well and gave no history of illness.

The infected pork as retailed in Aberdeen had been cooked in a factory in Glasgow, and on communicating with the Medical Officer of Health of Glasgow it was ascertained that the pork roll in question was one of six, packed in one case, purchased in Glasgow Meat Market, but that no information could be obtained concerning the pig from which the pork was derived, as the cases were shipped from America. The only possible handling of the pork in Glasgow occurred immediately prior or subsequent to the heating in the oven, as the pork rolls were then wrapped in grease-proof paper. Only four employees in the Glasgow factory were liable to have contaminated the pork; and specimens of fæces were obtained from these individuals and examined for the presence of *B. aertrycke*—all with negative results.

Bacteriological Investigation.—Non-lactose fermenting colonies were obtained from a specimen of fæces from one of the group of four cases. The biochemical reactions of two cultures were tested, and, after an incubation period of ten days, these organisms were found to produce acid and gas in glucose, mannite, dulcite, sorbite, trehalose, rhamnose, maltose, xylose, and inosite, while neither acid nor gas were produced in media containing lactose, salicin, saccharose, and raffinose. The organisms produced rapid blackening of lead acetate agar, but no indole was formed in peptone water.

Non-lactose fermenting colonies were also obtained from the specimen of pork, and two strains gave biochemical reactions similar in every way to those produced by the cultures obtained from the fæces.

All the organisms agglutinated to the full titre of a mono-specific Aertrycke agglutinating serum. Further, an agglutinating serum was prepared against one of the strains isolated from the fæces and reciprocal absorption tests between the stock strain of *B. aertrycke* and the new serum, and the isolated strains and the stock serum showed that all the strains were of the *B. aertrycke* type.

A specimen of fæces and a specimen of blood were also obtained from the maid-servant. No pathogenic organisms were obtained from the fæces, but the serum agglutinated *B. aertrycke* in a dilution of 1 in 120.

Finally specimens of blood and fæces obtained from each of the six employees engaged in the retail grocery shop were examined with negative results.

Conclusion.

The clinical and bacteriological findings in an outbreak of paratyphoid fever due to infected ice-cream as contrasted with the findings in an outbreak of Aertrycke enteritis due to infected pork, and as contrasted with the findings in an outbreak of Gaertner enteritis due to infected milk and recorded in the preceding paper afford support to the contention of Savage and Bruce White that paratyphoid fever is a definite disease caused by *B. paratyphosus* B, *B. paratyphosus* A, and possibly by *B. paratyphosus* C, and that it is never caused by the types of the Salmonella group, such as *B. aertrycke* or *B. enteritidis*, which are responsible for the great majority of food poisoning outbreaks.

VII.—*SONNE DYSENTERY IN ABERDEEN.

In the *Journal of Hygiene*, Volume XXIII., No. 1, October 15th, 1924, one of us (J. Smith) recorded a small outbreak of enteritis involving four infants which occurred in December, 1923, in a ward in Aberdeen City Hospital, and which was shown to be due to dysentery bacilli of the Sonne type. In reviewing the literature of Sonne dysentery, Smith referred to the work of Thjøtta (1919), who in investigating cases of dysentery in Norway, obtained 40 strains of Flexner dysentery bacilli and 25 strains of the Sonne type, and to Thjøtta's explanation that the less frequent finding of the Sonne type was due to the fact that this organism often causes a mild diarrhœa that was not sufficiently serious to necessitate the services of a physician, with the result that the cases were not subjected to bacteriological investigation.

Distribution of Dysentery in Aberdeen.

In the routine investigation of enteritis cases in Aberdeen since the outbreak of Sonne Dysentery in December, 1923, a diagnosis of dysentery has been confirmed bacteriologically in the following cases:—

I. *Amoebic Dysentery.*

(1) June, 1924—One case— cysts of *Entamoeba histolytica* found; developed from infection contracted abroad; responded to treatment with bismuth emetine iodide and emetine hydrochloride.

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*Fraser, Kinloch, and Smith, *Journal of Hygiene*, Vol. XXV., No. 4, 30th November, 1926.

(2) June, 1925—One case—cysts of *E. histolytica* found; relapse from infection contracted abroad; rapid response to emetine treatment.

(3) June, 1925—One case—cysts of *E. histolytica* found; infection contracted abroad; rapid response to emetine treatment.

(4) January, 1926—One case—*E. histolytica* and cysts found; history of three weeks' illness; patient had never been out of this country; no response to emetine treatment; patient died; at autopsy typical lesions of chronic amoebic dysentery.

(5) May, 1926—One case—cysts of *E. histolytica* found; relapse from infection contracted abroad; rapid response to emetine treatment.

(6) June, 1926—One case—cysts of *E. histolytica* found; relapse from infection contracted abroad; no response to emetine treatment; appendicostomy and colonic lavage with sodium bicarbonate resulted in subsidence of symptoms.

II. *Flexner Dysentery.*

(1) February, 1925—One case—*B. dysenteriæ* Flexner isolated from stools; contacts negative; source of infection not determined.

(2) April, 1925—One case—*B. dysenteriæ* Flexner isolated from stools; contacts negative; source of infection not determined.

(3) August, 1925—One case—*B. dysenteriæ* Flexner isolated from stools; contacts negative; source of infection not determined.

(4) November, 1925—One case—in a child in the Sick Children's Hospital; *B. dysenteriæ* Flexner isolated from stools; contacts negative; source of infection not determined.

(5) November, 1925—One case—being a relapse of infection contracted abroad; *B. dysenteriæ* Flexner isolated from stools.

(6) January, 1926—Twelve cases, in Burnside Home for Mothers and Babies; *B. dysenteriæ* Flexner isolated from stools of three of the cases; eleven of the twelve cases had practically simultaneous onset, the remaining case being due to contact infection; twenty-nine contacts negative; source of infection not determined.

III. *Sonne Dysentery.*

(1) October, 1925—Eight cases, in one of the scarlet fever wards of the City Hospital; *B. dysenteriæ* Sonne isolated from the stools of two of the cases, and serological confirmation in one case; all the cases had simultaneous onset and contacts negative; source of infection not determined.

(2) March, 1926—One case in a boy aged four years in west-end of the City; *B. dysenteriæ* Sonne isolated from stools; contacts negative; source of infection not determined.

(3) March, 1926—Twelve cases in the marasmus ward of the City Hospital; *B. dysenteriæ* Sonne isolated from the stools of five of the cases, and serological confirmation of diagnosis in eight cases; all cases had simultaneous onset; contacts negative; source of infection not determined.

(4) April, 1926—One case, in a child in the Sick Children's Hospital; *B. dysenteriæ* Sonne isolated from stools; source of infection not determined.

(5) May, 1926—Five cases in a household in the west-end of the City; *B. dysenteriæ* Sonne isolated from the stools of one of the patients, and this patient's blood serum agglutinated *B. dysenteriæ* Sonne in dilution of 1 in 1,600, while the blood serum of another of the five patients agglutinated *B. dysenteriæ* Sonne in dilution 1 in 6,400; onset practically simultaneous in all five cases; source of infection not determined.

(6) July, 1926—Six cases in the marasmus ward of the City Hospital; *B. dysenteriæ* Sonne isolated from the stools of two of the patients, and serological confirmation of diagnosis in five cases; the first of the cases was a recent admission, and was the probable source of infection of the other five cases, which sickened within a week of the first case being recognised.

From the above summary, it will be seen that in the routine investigation of enteritis cases in Aberdeen, during a period of thirty months, bacteriological confirmation has been obtained of—

I. Six unassociated cases of amoebic dysentery, one of which contracted the infection in this country; two of the six cases failed to respond to treatment with emetine preparations, and one of these died, the other recovering following on appendicostomy and colonic lavage.

II. Four sporadic cases of Flexner dysentery in which the sources of infection were undetermined; one relapsing case of Flexner dysentery in a patient who had contracted the infection abroad; an outbreak of twelve cases of Flexner dysentery occurring in Burnside Home for Mothers and Babies. All the seventeen cases responded rapidly to the exhibition of polyvalent anti-dysenteric serum and sodium sulphate.

III. Two sporadic cases of Sonne dysentery in which the sources of infection were undetermined; four outbreaks of Sonne dysentery, one of the outbreaks occurring in a private household, involving five persons, the second outbreak occurring in a scarlet fever ward of the City Hospital, involving eight persons, and the remaining two outbreaks occurring in the marasmus ward of the City Hospital, involving twelve infants and six infants respectively. All the thirty-three cases recovered following aperient treatment and water diet.

Varying Frequency of Different Types of Dysentery in Aberdeen.

It is found from the foregoing figures that in a period of thirty months the incidence of the various forms of dysentery as occurring in Aberdeen was of the following magnitude:—

I. Amoebic Dysentery . . .	6 cases.
II. Flexner Dysentery . . .	17 cases.
III. Sonne Dysentery	33 cases.

It is not contended that this proportion of 1 amoebic to 3 Flexner to 6 Sonne dysenteries is a reliable index of the relative proportions of the various dysenteries in their incidence in the City. As Thjøtta has pointed out, the Sonne organism often causes so mild a diarrhœa that the cases are not investigated, and it is reasonable to conclude that a considerable number of mild diarrhœal outbreaks of Sonne dysentery occurring in the City are never brought to the attention of the Health Department or to the notice of any medical practitioner.

It has to be pointed out, however, that twenty-six out of the thirty-three cases of Sonne dysentery here recorded were recognised as occurring within medical institutions in the City, wherein the patients are undergoing intensive observation. On the other hand, thirteen out of the seventeen cases of Flexner dysentery here recorded were recognised as occurring within medical institutions. In other words, 79 per cent. of the cases of Sonne dysentery and 76 per cent. of the cases of Flexner dysentery occurred in medical institutions where observation of patients may be regarded as being intensive. *So far as the evidence goes, therefore, it may be concluded that the Sonne bacillus is the most frequent cause of dysenteric outbreaks in Aberdeen.*

Finally, it is not suggested that all dysenteric outbreaks in Aberdeen are due either to *B. dysenteriæ* Sonne or to *B. dysenteriæ* Flexner. On the contrary, we have previously put on record (*Journal of Hygiene*, Vol. XXII., No. 1, October 31st, 1923) an epidemic of milk-borne enteritis in Aberdeen, in which the evidence pointed to the enteritis being due to a living bacillus of *unrecognised* type, and subsequent experience in the investigation of diarrhœal outbreaks has strengthened our former conclusion that viruses hitherto undetected can originate diarrhœal outbreaks simulating dysenteric infections.

Features of Sonne Dysentery.

Clinical Appearances.

There is a notable variation in the degree of severity of the dysenteric symptoms in different cases of Sonne dysentery. In exceptional cases the symptoms are of an urgent description, and two varieties of these urgent forms of Sonne dysentery can be recognised. In one variety the symptoms simulate those of acute Flexner dysentery with sudden onset of illness, diarrhœa and colic, and the rapid appearance of blood and mucus in the stools. In the second variety of the urgent form of the disease, the symptoms simulate those of Salmonella infections, or of the choleraic form of dysentery, with sudden onset, epigastric pain, vomiting, diarrhœa with green stools containing mucus but no blood, and rapid prostration.

In the great majority of cases of Sonne dysentery, however, the symptoms are of a much milder description, and are those of an irregular sub-acute diarrhœa with green stools containing mucus. In all forms of Sonne dysentery there is probably some elevation of temperature associated with the abrupt onset, but in the milder forms of the disease the rise of temperature is commonly slight and transient. Two temperature charts, one relating to the severe form of the disease and the other to the milder form, are submitted for comparison.

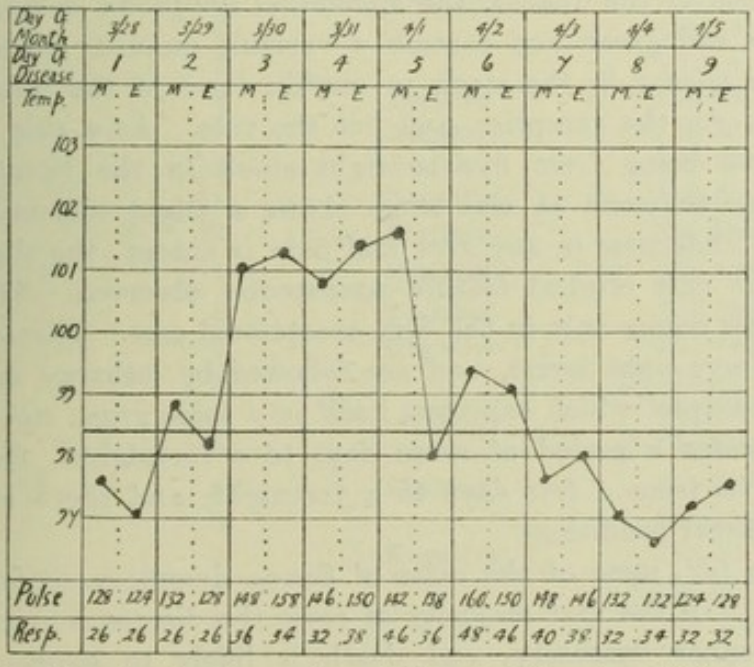


Chart I.—*Sonne dysentery* (severe form of disease), 1926. *Case*—I. W. (female).

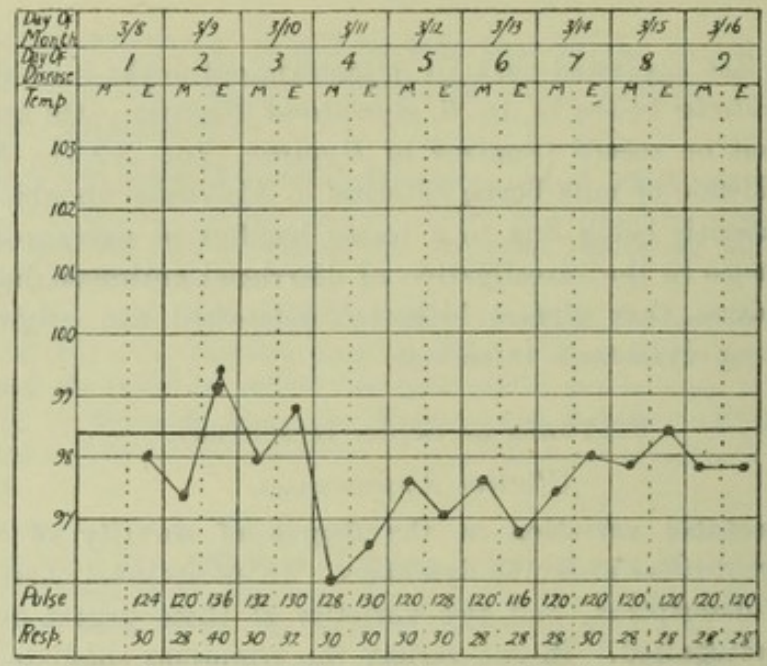


Chart II.—*Sonne dysentery* (mild form of disease), 1926. *Case*—M. B. (female).

In the common and mild form of Sonne dysentery the onset is abrupt and with slight rise of temperature, frequently associated with symptoms of a catarrh of the respiratory system. This catarrhal condition not infrequently precedes the development of abdominal symptoms or is coincident with them. The degree of catarrh varies from a simple catarrh of the upper respiratory passages to an acute bronchitis with marked increase in the respiratory rate, frequent cough and râles throughout the lungs. The duration of this catarrh is from a few days to a week. The involvement of the respiratory system in a catarrhal process is a notable feature of Sonne dysentery. It occurs more frequently in children than in adults, and it is much commoner in Sonne dysentery than the analogous bronchitis which appears in the early stages of enteric fever, particularly in young adults.

In the mild form of the disease, the abdominal symptoms develop early. The stools become loose and green and contain a variable quantity of mucus, but no blood. Blood does appear in the stools in certain cases of the mild form of the disease, but these form the exception and not the rule. As a rule, the diarrhœa is not urgent, there being from five to eight stools in the twenty-four hours. Examination of the abdomen at this stage shows a slight abdominal distension only. There is no tenderness in any area and pain is absent, the slight abdominal distension being the only clinical feature consistently observed. There is loss of appetite, but sickness occurs only in the very exceptional case. The acute symptoms endure for about forty-eight hours, and are followed by lethargy and a considerable degree of bowel upset which expresses itself in a loose green stool being passed once or twice daily for a period of seven days to a fortnight. Recovery is apparently complete in from a few days to a fortnight, and there is no enduring deterioration in general condition.

Mortality.—So far, none of the cases of Sonne dysentery confirmed bacteriologically have died. In the vast majority of cases the disease is relatively mild as compared with Flexner dysentery, and death is likely to happen only in the exceptionally acute choleraic case or in patients previously debilitated with other diseases.

Treatment.—In the absence of a specific therapy, the treatment is symptomic and resolves itself into aiding the elimination of the Sonne bacillus and its toxins by salines or castor oil and by water diet during the acute phase of the illness.

Control of Infection.—The control of Sonne dysentery is similar to the control of other enterica infections for which there is no specific prophylaxis. The early recognition and isolation of cases, the search for carriers, and the prevention of spread of infection by food and by nurses are the chief requirements.

Bacteriological Findings.

Flexner Dysentery.—From the seventeen cases of Flexner dysentery seven strains of the Flexner type of organism were isolated. These strains produced the typical sugar reaction and were agglutinated by a polyvalent Flexner agglutinating serum.

Sonne Dysentery.—The bacteriological findings in the thirty-three cases of Sonne dysentery are summarised in the following table:—

Outbreak.	Case No.	Bacteriological Examination.	
		Faeces.	Serum Agglutination.
1	1	Negative	< 1 in 50.
	2	,,	< 1 in 50.
	3	,,	< 1 in 50.
	4	,,	< 1 in 50.
	5	Positive	1 in 50.
	6	Negative	< 1 in 50.
	7	,,	< 1 in 50.
	8	,,	< 1 in 50.
2	1	Positive	Not done.
3	1	Negative	< 1 in 50.
	2	Positive	1 in 800.
	3	Negative	1 in 800.
	4	Positive	1 in 200.
	5	Negative	1 in 200.
	6	,,	1 in 50.
	7	,,	1 in 50.
	8	Positive	< 1 in 50.
	9	Negative	< 1 in 50.
	10	Positive	1 in 800.
	11	Negative	1 in 50.
	12	Positive	Not done.
4	1	Positive	1 in 1600.
5	1	Positive	1 in 1600.
	2	Negative	1 in 6400.
	3	,,	< 1 in 50.
	4	,,	< 1 in 50.
	5	,,	< 1 in 50.
6	1	Positive	1 in 800.
	2	,,	1 in 100.
	3	Negative	1 in 50.
	4	,,	< 1 in 50.
	5	,,	1 in 200.
	6	,,	1 in 800.

The repeated bacteriological examination of specimens of fæces from these cases indicates that it is of great importance to obtain specimens at the commencement of the illness. The colonies of *B. dysenteriæ* Sonne as obtained after culture on plates of M'Conkey's medium are easily identified, since they are usually much larger and more opaque than colonies of *B. dysenteriæ* Flexner, and their edges are often crenated. The sugar reactions of the various strains are also fairly uniform in character. Acid is produced in lactose by the primary culture in from three to five days, but subcultures rapidly acquire the property of attacking this sugar, and acid production then occurs after an incubation period of twenty-four to forty-eight hours. After being maintained in culture the strains produce acid in media containing glucose, mannite, arabinose, rhamnose, maltose, and saccharose, while no change occurs in media containing xylose, dulcite, sorbite, and inulin. The organisms also produce rapid blackening of lead acetate agar.

When the primary cultures are tested for specific agglutination with a high titre agglutinating serum no evidence of agglutination is, obtained after an incubation period of four hours at 55° C. After the strains have been subcultured several times, however, agglutination is obtained with low dilutions of the specific serum, and a later subculture will then be agglutinated to full titre. Absorption tests indicate that all strains can absorb completely the agglutinins from the anti-serum.

The blood from thirty-one cases was obtained after an interval of seven to twenty days from the onset of the illness. The serum from seventeen cases was found to give agglutination against a stock culture of *B. dysenteriæ* Sonne in dilutions ranging from 1 in 50 (the lowest dilution of the serum tested) to 1 in 6,400. Further, the blood serum from three cases was examined on several occasions, with the following result:—

		Agglutination.
Case A.	Serum 8 days after onset . . .	1 in 800.
	,, 14 ,, . . .	1 in 1600.
Case B.	Serum 8 days after onset . . .	< 1 in 50.
	,, 20 ,, . . .	1 in 200.
Case C.	Serum 4 days after onset . . .	1 in 50.
	,, 14 ,, . . .	1 in 200.

As a control to these agglutination reactions, the sera from twenty normal individuals have been tested, and in three cases agglutination was only obtained in a dilution of 1 in 25. The possibility of previous infection in these three cases could not be excluded.

The exo-toxins of B. dysenteriæ *Sonne.*

It has been recognised by various workers that an exo-toxin is produced by *B. dysenteriæ* Flexner and *B. dysenteriæ* Shiga, and further that the curative value of the antiserum depends partly on the presence of antitoxin. Accordingly preliminary experiments have been undertaken to ascertain whether *B. dysenteriæ* Sonne also produces a true exo-toxin. A strain of *B. dysenteriæ* Sonne was grown for two days at 37° C. in Hartley's modification of Douglas's trypsin broth

(*p*H 7·6). After the addition of phenol to give a concentration of 0·4 per cent., the culture was passed through a Berkfeld M. filter. Intradermal tests were then carried out in a group of twenty-eight young children, with the result that it was found that when 0·2 c.c. of various dilutions (1 in 100, 1 in 500, and 1 in 1,000) were injected intradermally, reactions were obtained in nineteen cases with the strongest dilution of the filtrate. No reactions were obtained when the filtrate was diluted 1 in 500 and 1 in 1,000. At this period culture medium diluted 1 in 100 was used as a control, but no reactions were obtained when 0·2 c.c. was injected intracutaneously. The reactions appeared within twenty-four hours and varied from 1 cm. to 2·5 cm. in diameter. They had practically disappeared after a further twenty-four hour period.

When the filtrate (diluted 1 in 100) was heated to 100° C. for one hour, it was found that the substance producing the reaction was destroyed, since tests on several individuals who reacted to 0·2 c.c. of 1 in 100 dilution of the filtrate gave entirely negative results with the heated filtrate. Further observations are being made to determine the relationship of this reaction to the actual disease, and efforts are being directed to produce an antiserum to effect the neutralisation of the toxic substance.

Summary.

1.—In the absence of the epidemic prevalence of the dysenteries over a period of thirty months it is found that cases of the various forms of dysentery as occurring in Aberdeen have been in the proportion of 1 amoebic, to 3 Flexner, to 6 Sonne dysenteries, and it is concluded that *B. dysenteriæ* Sonne is the most frequent cause of dysenteric outbreaks in Aberdeen in non-epidemic times.

2.—A description of the clinical and bacteriological features of Sonne dysentery is submitted.

3.—Preliminary experiments undertaken with a view to ascertaining whether *B. dysenteriæ* Sonne produces a true exo-toxin are described.

CHAPTER II.

HEALTH EDUCATION AND PROPAGANDISM.

Health education and propagandism have been pursued vigorously in Aberdeen during the past two years.

In the first place, various post-graduate and refresher courses for trained health workers have been provided under the auspices of the Aberdeen Town Council in collaboration with the University, the Burgh Health Insurance Committee, and other bodies. In May and June, 1926, a post-graduate course for medical practitioners in Aberdeen and the North-eastern Counties was conducted under the auspices of the University of Aberdeen. The Public Health section of the course was held at the City Fever Hospital, and extended over a period of three weeks. Over 100 medical practitioners regularly attended this course of instruction. There was also the refresher course of instruction for health visitors of the north-east area of Scotland, as organised by the Scottish Board of Health in 1926, which was provided at the City Fever Hospital.

In the second place, there was the fully organised Health Week which was held in Aberdeen in October, 1925, and which is referred to at some length in the 1925 Annual Report of the Scottish Board of Health. There was also the Health Exhibition provided for the delegates of the Scottish Insurance Committee during their visit to Aberdeen in October, 1926. In addition to these comprehensive Health Exhibitions, the Health Department repeatedly stages minor exhibitions at the City Hospital and various Child Welfare Centres for the instruction of the members of various voluntary associations and societies, and as an integral part of the Maternity and Child Welfare service.

In the third place, the Public Health Department receives the greatest assistance from the newspaper press of Aberdeen in providing health education and propagandism. Three admirable examples of the assistance provided by the press in this connection have reference to the propagandism aiming at the prevention of cancer which was undertaken in Aberdeen in March, 1925, the propagandism which was undertaken in connection with sunlight treatment, and the propagandism which was undertaken in connection with the prevention of diphtheria and scarlet fever by active immunisation. When the newspaper press thus provides every facility for health education, it is only proper that the material supplied to the press for this purpose should be fresh and attractive.

In all these educational activities, also, the freest use is made of pamphlets for popular instruction. Thousands of these are issued for general distribution in connection with all the health activities of the City, and these pamphlets are regularly on issue at the Public Health Offices and the various Health Centres throughout the City. They are also widely distributed by health visitors and other personnel of the Health Department.

As regards popular health lectures, these are provided in the freest manner in Aberdeen. Thus the Town Council provide from three to six popular lectures each year under the auspices of the Social Hygiene Council and Town Council. In addition, there is a great multiplicity of popular lectures given by the staff of the Health Department or arranged for by the Medical Officer of Health for a great variety of debating societies, women's guilds, and the like throughout the City. In fact, in regard to health education and propagandism, there is not the slightest difficulty in obtaining audiences in Aberdeen. The only anxiety is that it should not be overdone to such an extent that the public in general become wearied of such instruction. Up to the present time, however, there is no indication that these educative services are producing any staleness. On the contrary, the public demand for lectures is increasing, and it is difficult at times to meet popular requirements with the limited number of lecturers available. In this connection it has to be pointed out that the Health Department obtains admirable services in the way of popular lectures from several outstanding medical practitioners in the City.

As regards other agencies providing instruction on health matters, the Aberdeen Burgh Insurance Committee have always co-operated with the Town Council, and have on occasion arranged for newspaper articles on their own. Thus, two years ago the Insurance Committee arranged for a series of articles by medical practitioners, which were communicated to the local evening newspaper. With regard to these articles by medical practitioners, there was no programme of lectures arranged by the Insurance Committee. Medical practitioners were merely invited to write articles on any subject they chose, and these were passed on by the Insurance Committee to the press.

It seems important that there should be definite control of popular health education effort in every centre, and it appears that the Medical Officer of Health, who has a measure of the health requirements of the area and of the varying incidence of disease in the area, is the proper person to organise and supervise this department of health work. If it were considered desirable, the Medical Officer of Health might be aided by the appointment of a small committee for this purpose. It is not suggested that the Medical Officer of Health should prepare all material that is to be used for publicity. On the contrary, the more he relies on the various experts whose services can be obtained for this purpose not only in his own area but from beyond that area, the better will the material be. This subject was discussed at some length following on a paper by Lord Riddell at the Sanitary Congress in London in July, 1926, and the view just indicated was the general view of the London Congress. Thus, so far as London is concerned, it was suggested that the Ministry of Health should assume responsibility for the issue of all articles intended for the London press rather than that the various Medical Officers of Health of the London boroughs should act separately. London is a special problem, of course, and in the provinces the Medical Officers of Health, with the assistance of the local press, can emphasise the special problems relating to the individual districts.

I.—COURSE OF POST-GRADUATE STUDY, 1926.—CITY HOSPITAL SECTION.

ABERDEEN MEDICAL SCHOOL.

Programme and Time Table of Demonstrations.

The following are the headings under which the post-graduate course of instruction to Medical Practitioners was arranged:—

I.—INSTRUCTION IN FEVERS.

Drs. Kinloch, Smith, and Taylor.

Methods of diagnosis, prevention, and specific therapy.

May 18th (Tuesday) and May 20th (Thursday) } 2—5·30 p.m.

1. *Respiratory Diseases* (diphtheria, scarlet fever, measles, pneumonia, smallpox, and chickenpox).

May 25th (Tuesday) and May 27th (Thursday) } 2—5·30 p.m.

2. *Enterica Infections* (typhoid and paratyphoid fevers; dysenteries, including summer diarrhœa; food poisoning infections; intestinal parasites);
3. *Infectious Diseases of the Central Nervous System* (epidemic meningitis, tuberculous meningitis and other forms of meningitis; acute poliomyelitis; epidemic encephalitis);
4. *Diseases spread by Cutaneous Inoculation* (puerperal fever; erysipelas; venereal diseases; tetanus; anthrax); and
5. *Insect-borne diseases, and diseases of lower animals communicable to man* (infective jaundice; typhus; malaria; plague; relapsing fever).

II.—INSTRUCTION IN TUBERCULOSIS.

Drs. Banks, Smith, and Taylor.

June 1st (Tuesday) and June 3rd (Thursday) } 2—4 p.m.

1. Pathology and bacteriology of tuberculosis (including differentiation of human and bovine bacilli);
2. Clinical and radiographic diagnosis of pulmonary tuberculosis;
3. Prevention and treatment of pulmonary and extra-pulmonary tuberculosis, including—
   (*a*) examination of milk for tubercle bacilli; and
   (*b*) natural and artificial ultra-violet treatment.

III.—INSTRUCTION IN RICKETS AND MARASMUS.

Dr. Stephen and Mr. Weir.

June 1st (Tuesday) and June 3rd (Thursday) } 4·30—5·30 p.m.

Clinical demonstration of cases of rickets and marasmus to be preceded by a statement of the etiology, prevention and treatment of rickets and of the underlying nature of marasmus and its treatment accompanied by demonstration of—

(*a*) blood chemistry of rickets;
(*b*) radiograms in rickets; and
(*c*) ultra-violet radiation in rickets and marasmus.

II.—REFRESHER COURSE FOR HEALTH VISITORS.

Programme and Time Table of Demonstrations.

Monday, 3rd May.

Time.		*Place.*
10—11 a.m.	Introductory Lecture—"The Nurse and Public Health," by J. Parlane Kinloch, M.D., D.P.H., Medical Officer of Health	City Hospital
11 a.m.—12 noon	Lantern Lecture—"Mother and Child Welfare." by James A. Stephen, M.B., D.P.H., Child Welfare Medical Officer	Do
12 noon—1 p.m.	Lecture—"Administrative Aspect of Tuberculosis," by George S. Banks, M.B., D.P.H., Tuberculosis Medical Officer	Do.
2·30—3·30 p.m.	Lecture-Demonstration on Venereal Disease in Women and Children, by Frederick J. T. Bowie, M.B., D.P.H., Junior Venereal Diseases Medical Officer	Do.
3·30—4 p.m.	Demonstration of Cases in Ailing Babies' Ward, by Dr. Stephen	Do.

Tuesday, 4th May.

10—11 a.m.	Lecture-Demonstration—"Sunshine and Health," by John S. Taylor, M.B., D.P.H., Senior Resident Physician, City Hospital	Do.
11 a.m.—12 noon	Lecture—"The need for Ante-natal Instruction," by Dr. Stephen	Do.
12 noon—1 p.m.	Lecture—"Prevention of Tuberculosis," by Dr. Banks	Do.
2·30—4 p.m.	Demonstration—Child Hygiene and Economics, by Mrs. G. B. Esslemont, President of Aberdeen Mother and Child Welfare Association, and Dr. Stephen	Charlotte Street Centre and Day Nursery

Wednesday, 5th May.

10—11·30 a.m.	Lecture-Demonstration on Breast Feeding, by Dr. Stephen and Miss Christina R. Laing, M.B., D.P.H., Assistant Child Welfare Medical Officer	Burnside Home
11·30 a.m.—1 p.m.	Lecture-Demonstration—"Immunity and Immunological Methods," by Dr. Taylor	City Hospital
2·30—3·15 p.m.	Demonstration of Tuberculosis Cases, by Dr. Banks	Tuberculosis Institute (City Hospital)
3·15—4 p.m.	Lecture-Demonstration—"Environmental Hygiene," by Douglas W. Berry, M.C., M.D., D.P.H., Lecturer in Public Health, Aberdeen University	City Hospital

Thursday, 6th May.

10-11 a.m.	Lecture-Demonstration—"Protean Nature of Tuberculosis and its Diagnosis," by Dr. Banks	City Hospital
11 a.m.-12 noon	Lecture-Demonstration—"Ultra-Violet Rays"—Their Spectrum, Production and Biological Action," by Dr. Taylor	Do.
12 noon-1 p.m.	Lecture-Demonstration on Ante-natal Care and Methods by Professor M'Kerron, Professor of Midwifery, Aberdeen University	Maternity Hospital
2·30-3·30 p.m.	Lecture—"Organisation of School Medical Inspection," by George Rose, M.B., D.P.H., School Medical Officer	City Hospital
3·30-4 p.m.	Demonstration of Special Cases, by Dr. Stephen	Do.

Friday, 7th May.

10-10·45 a.m.	Lecture-Demonstration on "Artificial Feeding," by Dr. Stephen	City Hospital
10·45—11·30 a.m.	Demonstration on Nutritional Chemistry, by A. B. Weir, B.Sc., A.I.C., City Chemist	Do.
11·30a.m.—1 p.m.	Lecture-Demonstration—"Active and Passive Immunity and their Application to Various Diseases," and Demonstration of Schick and Dick Testing, by Dr. Taylor	Do.
2·30—3·30 p.m.	Lecture-Demonstration—"Nurses' duties in relation to School Medical Inspection, Following up and Treatment—Vision Testing," by Dr. Rose	Do.
3·30—4 p.m.	Visit to Loch Street Home for Mothers and Children (Dr. Stephen)	41, Loch Street

Monday, 10th May.

10 – 11 a.m.	Lecture-Demonstration—"Natal and Neo-natal Care of Mother and Child," by Miss Laura S. Sandeman, M.D., Physician (Special Lecturer to Mother and Child Welfare Department)	City Hospital
11 a.m.-12 noon	Lecture—"The Feeding and Care of Toddlers," by Dr. Laing	Do.
12 noon-1 p.m.	Demonstration of Heliotherapy in— (*a*) Pulmonary Tuberculosis ; (*b*) Non-Pulmonary Tuberculosis ; (*c*) Rickets ; (*d*) Marasmus ; (*e*) Skin Diseases ; by Dr. Taylor	Do.
2·30-3·30 p.m.	Lecture-Demonstration on Venereal Disease in Women and Children, by Dr. Bowie	Do.
3·30-4 p.m.	Demonstration of Orthopædic Cases in Ailing Babies' Ward, by Dr. Stephen	Do.

Tuesday, 11th May.

10 a.m.-1 p.m.	Visits to Special Schools (Dr. Rose)	
2·30-4 p.m.	Visits to School Clinics (Dr. Rose)	

Wednesday, 12th May.

10—11 a.m.	Lecture-Demonstration—"Care of the Teeth—Rickets," by Dr. Stephen	City Hospital
11 a.m.—12 noon	Lecture-Demonstration—"Diseases of the Nose, Throat, and Ear in Children," by Hugh R. Souper, M.D., Otologist, City Hospital	Do.
12 noon—1 p.m.	Lecture-Demonstration—"The Home and how to keep it—the Weekly Budget," by Dr. Stephen	Do.
2·30—4 p.m.	Demonstration of— (*a*) Schick and Dick Testing and Deductions by Dr. Taylor ; (*b*) Laboratory Methods, by John Smith, M.D., D.P.H., City Bacteriologist	Do.

Thursday, 13th May.

10—11·30 a.m.	Demonstration of Cases—Mothers and Babies, by Dr. Stephen and Dr. Laing	Burnside Home
11·30 a.m.-1 p.m.	Demonstration of Artificial Sun Treatment as applied to Tuberculosis, Rickets, Marasmus, and Skin Diseases, with special reference to (1) Dosage, (2) Estimation of Dosage, (3) Dangers of Overdosage, by Dr. Taylor	City Hospital
2·30-3·30 p.m.	Lecture—"Mental and Physical Defectives," by Dr. Rose	Do.
3·30-4 p.m.	Demonstration of Special Cases by Dr. Stephen	Castlegate Centre

Friday, 14th May.

10-11 a.m.	Lecture Clinic—Tuberculosis Nursing—Institutional and Domiciliary, by Dr. Banks	City Hospital
11 a.m.-12 noon	Demonstration of Tuberculosis Cases, by Dr. Banks	Tuberculosis Institute
12 noon-1 p.m.	Lecture-Demonstration—"Skin Conditions in Children under 5 years"—General with Demonstration—by Dr. Stephen	City Hospital
2·30 p.m.	Closing Lecture—"Recent Advances in Nursing —A Review," by Dr. Kinloch	Do.

III.—SCOTTISH ASSOCIATION OF INSURANCE COMMITTEES.

Conference—Aberdeen, 24th and 25th September, 1926.

AN EXHIBITION ILLUSTRATING RECENT ADVANCES IN HEALTH WORK,

Held within the City Hospital, Urquhart Road, on Friday, 24th September (3-6 p.m.).

I.—PATHOLOGICAL SECTION (DR. SMITH).

1. Microscopic demonstration of pathogenic micro-organisms, with special reference to—
   (*a*) Streptococci of scarlet fever, puerperal fever, erysipelas, and rheumatism.
   (*b*) Food poisoning bacilli.
2. Macroscopic demonstration of intestinal parasites.
3. Methods of culturing pathogenic organisms.
4. Outfits for bacteriological and serological diagnosis.
5. Demonstration of human pathological specimens.
6. Administrative methods in the Aberdeen Bacteriological and Pathological Services.

II.—IMMUNOLOGICAL SECTION (DR. TAYLOR).

1. Demonstration of specific sera for treatment of acute infectious diseases.
2. Demonstration of modern methods of preventing scarlet fever, diphtheria, measles, small-pox, typhoid fever, and tetanus.

III.—VENEREAL DISEASES SECTION (DR. BOWIE).

Modern Methods of prevention and treatment.

IV.—TUBERCULOSIS SECTION (DR. BANKS).

1. Radiographic demonstration of pulmonary and extrapulmonary tuberculosis.
2. The progressive development of tuberculin reactions in the families of tuberculous parents.
3. Demonstration of human pathological specimens.
4. Demonstration of X-rays apparatus.
5. Administrative methods in the Aberdeen Tuberculosis Service.

V.—MATERNITY AND CHILD WELFARE SECTION (DR. STEPHEN).

1. Satisfactory and unsatisfactory diets, with special reference to certified milk, pasteurised milk, standardised and refined cod-liver oils, ostelin, &c.
2. Rickets, its prevention and cure, demonstrated by radiograms, human and animal.
3. Administrative methods in the Aberdeen Mother and Child Welfare Service.

VI.—Ultra-violet Radiation and Sunlight Therapy (Drs. Banks and Taylor).

1. Ultra-violet radiation as a preventive of disease.
2. Ultra-violet radiation in the treatment of pulmonary and extrapulmonary tuberculosis, rickets, marasmus, and wasting diseases generally.
3. Demonstration of natural sunlight treatment.
4. Demonstration of artificial sunlight treatment by carbon arc and mercury vapour lamps.
5. Methods of measuring output of ultra-violet rays from various sources.

VII.—Personal and Environmental Hygiene (Dr. Berry).

1. Nutritional requirements.
2. Museum demonstration.

VIII.—Public Health Veterinary Medicine (Mr. M'Allan, M.A., B.Sc., M.R.C.V.S.).

1. Demonstration of the routine veterinary examination of flesh for human consumption.
2. Demonstration of animal pathological specimens.
3. Demonstration of animal parasites.
4. Administrative methods in the Aberdeen Service.

IX.—Practical Sanitation (Mr. Cumming, Chief Sanitary Inspector).

1. Environmental sanitation.
2. Food adulteration and its prevention.

X.—Chemical Section (Mr. Weir, B.Sc., A.I.C.).

1. Demonstration of food and drug analyses.
2. The rôle of chemistry in diabetes, rickets, &c.

IV.—HEALTH WEEK.

A Health Exhibition, under the auspices of the Aberdeen Town Council and the Aberdeen Burgh Insurance Committee, was held at the City Hospital from Wednesday, 7th October, to Saturday, 10th October, 1925. The timing of the Exhibition was particularly opportune in view of the fact that the Scottish Council of Women Citizens were holding their 5th Annual Congress in Aberdeen at this period, and that the Travelling Exhibition of Maternity and Child Welfare work of the National Council of Women was available to form a nucleus for the Health Exhibition. The City Hospital was deliberately chosen as the locus of the Exhibition in order that the extent of the preventive and curative work carried out there might be brought to the attention of the citizens, and with a view to popularising the whole of the City Hospital services. The choice of the City Hospital as a site for the Exhibition has been abundantly justified by its success, some 5,000 people attending the Exhibition daily.

Two empty wards were available to house the main part of the Exhibition, and there was included in the Exhibition comprehensive sections dealing with the following activities, viz. :—(1) Bacteriology, (2) Pathology, (3) Chemistry, (4) Immunology, (5) Serology, (6) Tuberculosis, (7) Venereal Diseases, (8) Mother and Child Welfare, (9) Hygiene, (10) Nutritional Requirements and Food Values, (11) Practical Sanitation, and (12) Heliotherapy.

Literature dealing with the prevention of tuberculosis, cancer, infectious diseases, vermin, and venereal diseases, and with milk and nutritional requirements was made freely available.

The occasion was found opportune for extensive propagandism in connection with the prevention of diphtheria and scarlet fever by means of the new protective devices.

The tuberculosis wards with their extensive artificial sunlight equipment formed a feature of the Exhibition, as did also the laboratories and X-rays installation.

An evening lecture programme was submitted, and proved successful.

The experience gained as a result of this Exhibition indicates that such an Exhibition has a high educational value and might well be repeated with advantage at five-yearly intervals. The artificial sun lamps and X-rays apparatus were the most popular exhibits. October is rather late in the year for such an Exhibition, and it is suggested that future Exhibitions should be staged in June. In June, the number of patients in Hospital is at a much lower level than in October, and the Hospital grounds are then much more attractive. At that time also the advantages of natural sunlight treatment can be emphasised.

The distribution of the sections was as follows :—

1.—Bacteriological Section (Dr. Smith). *9 Tables.*

Collection of Specimens—

Sputum, pus, blood (Wassermann and Widal).
Broth in phials for transmission of blood cultures.
Throat and nose swabs.

Culture Media—

Gelatine, broth, solidified serum, M'Conkey's nutrient agar, egg medium, various sugar media.

Various Bacterial Filters.

Pathogenic Bacteria—

Microscopic demonstration of—

Tubercle bacillus, gonococcus, bacillus typhosus, bacillus diphtheriae, Hoffmann's bacillus, streptococcus scarlatinae, streptococcus rheumaticus, meningococcus, spirochaete of syphilis, trypanosomes.
Ova of oxyuris vermicularis and adult specimen.
Ova of ascaris lumbricoides and adult specimen.
Ova of taenia saginata and adult specimen.
Ova of trichocephalus dispar and adult specimen.

Buerker Cell-counting Chamber and Haemoglobinometer.

Cultures of—

B. typhosus on agar.
B. tuberculosis on egg—(*a*) human, (*b*) bovine.
B. coli on M'Conkey's medium.
Streptococcus scarlatinae on blood-agar and in broth.
Staphylococcus on blood-agar.

Fermentation Reactions of B. Coli in—

Lactose, glucose, mannite, dulcite, salicin, and saccharose.

Various Blood Cultures.

Examination of Water Samples—

(*a*) Good quality.
(*b*) Bad quality.
Outfit for bacteriological examination of water.

Examination of Milk Samples—

Estimation of B. coli—

1 c.c., 0·1 c.c., and 0·01 c.c. of a milk are added to three tubes containing lactose, bile salt broth. After incubation for forty-eight hours at 37° C., the tubes showing acid (yellow) and gas contain B. coli.

Certified milk should not show B. coli in 0·1 c.c.

Bacterial count of milk samples—

Dilutions 1 in 100, 1 in 1,000, 1 in 10,000, 1 in 100,000. These dilutions of the milk sample are made in sterile water; 1 c.c. of each dilution is then added to 10 c.c of agar and plated out. After incubating for forty-eight hours at 37° C. the number of colonies is counted, each colony being taken to have originated from a single bacillus.

Certified milk should not contain more than 30,000 organisms (capable of growing at 37° C.) per c.c.

Parkes enumerating disc.

Outfit for collection and transmission of milk samples.

Card for report on milk samples; milk producer's record; milk examination card.

2.—Pathological Section (Dr. Smith).

Collection of Specimens—

Tuberculosis of lung (5 specimens showing various stages).

Tuberculosis of lung, intestine, and abdominal glands.

Tuberculosis of larynx.

Tuberculosis in bovines—mammary gland, uterus and tubes, rib, lung, spleen, and knee.

Tuberculosis in pig—lung (miliary) and vertebrae.

Pneumonia of sheep, cow, and pig.

Sarcoma of the heart of cow.

Pericarditis (traumatic) in cow.

Cystic kidney of cow with calculi, also same of pig.

Swine erysipelas—skin and heart.

Swine fever—large intestine.

Ox-tongue—foot and mouth disease.

Dibothriocephalus Latus.

Ascaris Suis.

3.—Chemistry Section (Mr. Weir). *2 Tables.*

Colorimeter for the estimation of blood-sugar.

Blood cholesterol tests.

Blood phosphate tests.

Gutgeit test for arsenic in food and drugs.

Marsh test for arsenic.

Arsenic chloride test for Vitamin A in cod liver oil and other oils.

Urea estimation in urine with sodium hypobromite.

Fehling's test for sugar in urine.

Esbach's albuminometer.

Gerber's test for milk-fat estimation; Adams' process for same.

4 and 5.—Immunological and Serological Section (Dr. Taylor). *8 Tables.*

Scarlet Fever—

Plates of rashes; Dick test illustrated; toxins for immunising; Dick test toxin and control ready for use.

Diphtheria—

Schick test illustrated; toxoid-antitoxin; Schick toxin and control ready for use.

Combined scarlatina and diphtheria prophylactic.

Measles—

Plates of rashes; Koplik's spots; convalescent serum.

Typhoid Fever—
Vaccines.

Small-pox—
Plates of rashes; vaccination; calf lymph.

Specific Sera—
Anti-leptospira serum; anti-botulinus serum; anti-tetanic serum; anti-meningococcic serum; anti-dysenteric serum; anti-diphtheriac serum; anti-pneumococcic Type I. serum; Mulford's antibody solution; Sclavo's serum.
Streptococcal antisera—erysipelas, puerperal, scarlatinal and polyvalent, with charts showing therapeutic effects.

Specific Chemicals—
Quinine; salvarsan; emitine; silver nitrate; mercurochrome; hexyl-resorcinol.

Charts showing Incidence of Certain Diseases in Aberdeen—
Attack incidence of scarlet fever in City Hospital staff.
Attack incidence of scarlet fever in population.
Attack incidence of diphtheria in City Hospital staff.
Attack incidence of diphtheria in population.
Epidemic of acute poliomyelitis, 1916.
Food poisoning due to B. Enteritidis of Gaertner, 1925.
Enteric (Scotland) death-rate, male and female, 1871-1925.
Typhoid outbreak—Peterhead, 1907, daily number of cases.
Typhoid outbreak—Aberdeen, 1912, daily number of cases.
Typhoid outbreak—Aberdeen, 1918, daily number of cases.

6.—Tuberculosis Section (Dr. Banks). *6 Tables.*

Records—clinical; domiciliary; hospital; treatment; school; family; occupational; health visitors'.
Public warnings, &c.
Radiograms showing tuberculosis of bones; various lesions of the chest—acute, chronic, old calcified, occult, advanced, and glandular.
Models illustrating tuberculosis of neck glands, knee, and lung.
Administrative records in addition to above—out-patient, hospital, and general.
Radiograms of lungs showing developing tuberculosis, healed, and old fibrosis.
Series showing collapse of lung after artificial pneumothorax.
Series—lung abscess with cure.
Series—foreign body showing progress through lung.
Massive pulmonary disease in childhood.
Cervical caries.
Photographs showing the application of heliotherapy—artificial and natural.
Artificial pneumothorax apparatus.
Sanocrysin (gold) treatment; Ruppel serum treatment.
Wall charts—Tuberculosis in Aberdeen, 1856-1925, incidence and mortality.

7.—Venereal Diseases Section (Dr. Bowie). *1 Table.*

Literature—dangers, transmission, facilities for treatment.
Plates showing various skin lesions of syphilis.
Case records.
Drugs, vaccines, &c.
Records and reports.

8.—Mother and Child Welfare Section (Dr. Stephen). *3 Tables.*

Photographs of clinics at Centres and at Burnside Home for Mothers and Babies.

Rhondda Shield.

Weighing machine, spring balance, and measuring board.

Records—

Notification of births; home visitation; Centre cards; Day Nursery; Maternity Hospital; Ante-natal Annexe; dental treatment; maternal deaths; weight charts.

Sanitary bottles and teats.

Photographs of ultra-violet treatment in the Ailing Babies' Ward.

Clothing and basket for premature babies.

Rickets—

Radiograms showing in series—

Rats on rachitogenic diet.
Rats on rachitogenic diet and ultra-violet radiation.
Rats on rachitogenic diet and ultra-violet radiation through glass.
Rats on rachitogenic diet and ostelin.
Rats on control diet.

Human rickets.

Natal and Ante-natal—

Beds; urine testing; sphygmomanometer.
Record cards.
Placards showing the advantages of ante-natal care.

Clothing Stall—

Good and condemned garments annotated.
Home-made cradle and renovated clothes.

Day Nursery—

Babies' pen, tables and chairs, cradle, stretcher.
Placards illustrating benefits of fresh air, fire-guards, &c.

9.—Hygiene Section (Dr. Berry). *7 Tables.*

Placards.
Water purification—good and bad water.
Sewage disposal.
Water filters.
Damp-proof course (series); Ellison's brick.
Ventilation—Mica flap, Moore's louvres and circular disc, Boyle's cowl extractor, Tobin's tubes, Boyle's system for ships, Hinckes-Bird window.
Apparatus for showing the heat-retaining properties of clothing—wool, silk, and cellular cotton.
Various water filters.
Pipes—lead, tin-lined, and iron.
W.C.'s—wash-out, wash-down, hopper.
Wash-hand basins, sinks, baths.
Model house drainage complete to sewer.
Intercepting and gully traps, inspection openings.
Faulty drains.
Septic tank model.

10.—Nutritional Requirements and Food Values (Dr. Berry, in Collaboration with School of Domestic Science).

Pasteurised milk; certified milk; literature.

Various Diets—

Invalid Trays.

Possible Diabetic Diet.

Breakfast—2 oz. bacon; 1 scrambled egg; 1 oz. diabetic bread; tea; diabetic milk; saccharine.

Dinner—4 oz. meat; cabbage; plenty of butter; 2 oz. potatoes; water or spirit and water.

Tea—1 softly-boiled egg; 1 oz. diabetic bread; plenty of butter; tea as above.

Supper—2 oz. steamed fish; butter sauce; 1 pint diabetic milk.

Notes.—(1) Avoid as far as possible all carbohydrates, substitute fats and proteins.

(2) The above diet is a very possible one, but it will be found that in each separate case of the disease it will have to be treated on its own merits.

Helpful Diet in Constipation.

On rising—Glass of cold water.

Breakfast—Orange or grape fruit; softly-boiled egg; brown bread and butter; marmalade or honey; grapes; porridge and milk.

Dinner—Roast meat; two green vegetables; (greens); stewed prunes; grapes and figs.

Tea—Salad; brown bread and butter.

Supper—Fruit; brown bread and butter.

Note.—Give foods rich in cellulose and mineral salts.

Phthisis.

On wakening—1 glass heated milk, preferably certified.

Breakfast—Porridge and cream; bacon, egg, and bread cooked in bacon fat; bread, plenty of fresh butter; tea or coffee.

11 a.m.—1 glass certified milk and biscuit.

Dinner—Soup; cutlet; green vegetable; potatoes; bread with fresh butter; suet pudding; glass of milk (this may be taken between dinner and tea).

Tea—Bread and butter, &c.

Supper—Baked fish; butter sauce; bread and butter; 1 glass milk.

The aim in serving foods in cases of phthisis is to introduce all kinds of fats, especially the more easily digested, *e.g.*, cream, butter, bacon fat, olive and cod liver oils.

Convalescence.

Breakfast—Poached egg on toast; toast, butter; coffee or tea.

11 a.m.—Glass of milk and biscuit.

Dinner—Braised sweetbread; creamy potatoes; cauliflower and sauce; milk jelly; cup custard.

Tea—Steamed fish and sauce; bread and butter; tea.

Supper—Cup of arrowroot and biscuit.

Note.—Foods rich in protein and fats, those easily digested, to be given to restore the tissues.

Child's Convalescence Tray.

On wakening—1 orange or apple.
Breakfast—Porridge and cream; softly-boiled egg; bread, butter, and milk.
11 a.m.—Glass of milk and biscuit.
Dinner—Tapioca cream soup; fish cream egg; jelly (in egg shell shape).
Tea—Bread and butter; sponge cake; milky tea.
Supper—Egg drink and biscuit.

Note.—The food must be attractive, light, and nourishing.

Placards showing the composition of cereals and various meats, with vitamin content.

11.—Practical Sanitation Section (Mr. Cumming).

Literature—Prevention of spread of infectious diseases; Pamphlet—Aspects of the Milk Problem; Medical Officer of Health's Report, 1924.
Records—School and domestic; inspection cards—bakehouse and workshop.
Plans of the Housing Improvement Scheme, 1925.
Photographs of the scheduled areas under the Housing Scheme.
Rat Destruction—Appliances and literature.

12. Heliotherapy (Drs. Banks and Taylor)—Ward IV.

This consisted of a display of the various kinds of ultra-violet lamps, and their practical application, together with methods of photometry by means of the photo-electric cell.

CHAPTER III.

INFECTIOUS DISEASES.

Table I. gives the death-rate from each of the princpal infectious diseases since the commencement of registration. In Table II. the number of cases and deaths for each disease is stated for the successive months of the year. Table III. gives the cases of infectious diseases notified in different sized houses; and Table IV. gives the morbidity and mortality of infectious diseases distributed according to ages and wards of the City. In Table V. the cases and deaths, together with the case-mortality or percentage of deaths to sicknesses in certain diseases, are supplied for each of the years 1915 to 1925, as also the averages for the 1905-1914 and 1915-1924 decades.

DISEASES WITH A SPECIFIC PROPHYLAXIS.

Small-pox.

One case of this disease was notified during the year. The patient, a male adult aged 48 years, was admitted to the City Hospital on 21st January, 1925, and made a satisfactory recovery. The man was temporarily employed at Aberdeen, but had spent Christmas at his home in Middlesbrough, returning to Aberdeen on the evening of 30th December, 1924. He was in good health until 13th January, when he sickened with symptoms of influenza, which caused him to remain indoors but did not confine him to bed. On the 18th January the eruption developed. The patient did not seek medical advice until 21st January, when he was recognised as a case of the mild form of small-pox that was so prevalent in England at that time. On inquiry at the Medical Officer of Health of Middlesbrough, it was ascertained that the patient's son had suffered from mild small-pox at Christmas, although the condition had not been recognised until the time of the Aberdeen inquiry. All known contacts in Aberdeen were vaccinated and re-vaccinated, and all known infected premises disinfected. The Vaccinia test and Paul test applied to the patient were negative. Fortunately, no secondary cases of small-pox arose from this case in Aberdeen.

Vaccinia.

Table VI., on page 113, shows the percentage of the total surviving children at the end of the calendar year following the year of birth who have remained unvaccinated in each year from 1907 to 1924. In 1924 the proportion of children thus escaping vaccination was 7·7 per cent., as against 8·6 in 1923 and 9·6 in 1922.

Scarlet Fever.

The prevalence of scarlet fever, which had been low since 1922, exhibited itself in epidemic form in October of 1925, when 119 cases were notified. The

TABLE I.—ABERDEEN.—DEATHS AT ALL AGES FROM SELECTED CAUSES (per 100,000 of population).—*Years* 1856-1925.*

Year.	Small-pox.	Scarlet Fever.	Diphtheria and Croup.	Measles.	Whooping Cough.	Influenza.	Typhus Fever.	Typhoid Fever.	Tuberculous Diseases.		Dis. of Digest. Sys. (incl. Diarrhœa).	Cancer and other Malignant Diseases.	Bronchitis.	Pneumonia.	Dis. of the Circl. System, †excluding Cerebral Embolism & Thrombosis
									Respiratory.	Other Tuberculous.					
1925, . . .	0	9	14	17	34	11	0	0	97	27	83	149	59	76	193
1924, . . .	0	2	7	35	45	34	0	1	91	44	63	145	85	90	215
1923, . . .	0	2	5	26	3	7	0	2	80	43	87	132	68	76	196
1922, . . .	0	6	9	88	63	64	0	0	89	26	78	153	99	129	191
1921, . . .	0	5	23	1	1	18	0	0	89	17	94	129	96	98	193
1920, . . .	0	2	17	26	17	34	0	1	98	32	92	130	104	129	169
Average 1920-1924,	0	3	12	35	26	31	0	1	89	32	83	138	90	104	193
1919, . . .	0	2	20	1	20	126	0	3	88	43	66	124	100	120	170
1918, . . .	0	2	13	27	33	168	0	9	111	51	81	111	100	157	177
1917, . . .	0	7	11	52	29	22	0	1	116	57	104	112	101	118	175
1916, . . .	0	17	21	6	18	17	0	1	116	34	93	126	89	86	198
1915, . . .	0	86	30	90	43	21	0	1	135	45	126	129	123	141	200
Average 1915-1919,	0	23	19	35	29	71	0	3	113	46	94	120	103	124	184
,, 1916-1920,	0	6	16	22	23	73	0	3	106	43	87	121	99	122	178
,, 1911-1915,	0·2	38	42	56	32	16	0	4	111	49	124	116	101	128	184
,, 1906-1910,	0	6	15	26	42	20	0	2	116	61	115	103	105	116	180
,, 1901-1905,	0·1	8	9	41	47	20	2·6	3·6	138	69	162	87	145	125	179
,, 1896-1900,	0	23	18	35	53	29	0·2	9	167	70	210	87	172	109	167
,, 1891-1895,	0·4	21	22	63	52	56	1·0	10	181	72	190	81	210	100	156
,, 1886-1890,	0·8	14	10	80	66	9	1·4	15	184	67	202	68	216	100	175
,, 1881-1885,	0·2	13	15	36	67	1	6	13	204	74	185	69	251	82	159
,, 1876-1880,	0·6	35	30	28	66	2	19	29	223	101	194	61	286	72	146
,, 1871-1875,	48	68	30	53	68	5	20	35	243	107	214	56	281	60	136
,, 1866-1870,	3·6	71	5	50	62	8	62	49	298	130	259	59	238	70	122
,, 1861-1865,	36	93	49	51	62	12	176		274	128	280	57	220	59	122
,, 1856-1860,	40	118	54	70	69	12	109		322	179	203	56	182	58	111

* Corrected for transferred deaths in 1904 and subsequent years. † From 1911 onwards.

TABLE II.—PROGRESS OF INFECTIOUS AND CERTAIN OTHER DISEASES IN YEAR 1925.

(Not corrected for transferred deaths.)

DISEASE.	1925.												Whole Year.
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
A. Compulsorily Notifiable.													
Small-pox ..... Cases	1	...	...	...	...	...	...	...	...	...	...	...	1
Small-pox ..... *Deaths*	...	...	...	...	...	...	...	...	...	...	...	...	...
Scarlet Fever ..... Cases	30	34	47	38	45	42	62	54	63	119	92	86	712
Scarlet Fever ..... *Deaths*	...	*1*	*1*	...	*2*	*2*	*3*	...	*2*	*2*	*1*	*1*	*15*
Diphtheria..... Cases	45	44	33	37	34	36	34	24	24	52	40	29	432
Diphtheria..... *Deaths*	*4*	*4*	*3*	*2*	*1*	*1*	*2*	*1*	*1*	...	*1*	*2*	*22*
Typhus Fever ..... Cases	...	...	...	...	...	...	...	...	...	...	...	...	...
Typhus Fever ..... *Deaths*	...	...	...	...	...	...	...	...	...	...	...	...	...
Enterica Infections... Cases	1	...	1	...	2	1*	2x	24§	5x	1*	3x	...	40
Enterica Infections... *Deaths*	...	..	...	...	..	...	...	...	...	...	...	...	...
Dysentery .. .. Cases	...	1	...	1	...	2	...	1	...	8	2	...	15
Dysentery .. .. *Deaths*	...	...	..	..	...	...	...	...	...	...	...	...	...
Acute Poliomyelitis... Cases	...	...	...	...	...	1	...	1	...	1	...	2	5
Acute Poliomyelitis... *Deaths*	...	...	...	...	...	...	...	...	...	...	...	...	...
Epidemic Cerebro-Spinal Meningitis Cases	...	1	...	...	...	...	...	...	...	...	...	...	1
Epidemic Cerebro-Spinal Meningitis *Deaths*	...	...	..	...	...	...	...	...	...	...	...	...	...
Epidemic Encephalitis ..... Cases	...	...	2	2	1	..	1	...	1	2	...	...	9
Epidemic Encephalitis ..... *Deaths*	...	...	...	...	...	...	...	...	...	...	...	...	...
Acute Pneumonia — Primary—Cases	30	29	52	62	43	37	28	23	35	39	59	60	497
Acute Pneumonia — Influenzal—Cases	1	3	3	5	1	1	1	0	4	6	7	7	39
Tubercle — Pulmonary — Cases	14	16	21	25	29	25	10	14	20	14	18	21	227
Tubercle — Pulmonary — *Deaths*	*18*	*9*	*20*	*16*	*11*	*15*	*16*	*11*	*11*	*14*	*10*	*12*	*163*
Tubercle — Other ... Cases	18	9	9	12	15	11	21	5	7	17	7	13	144
Tubercle — Other ... *Deaths*	*3*	*5*	*7*	*4*	*3*	*8*	*5*	*5*	*4*	*7*	*5*	*5*	*61*
Erysipelas..... Cases	18	8	13	8	9	4	6	8	9	19	11	11	124
Erysipelas..... *Deaths*	*3*	...	*2*	...	...	.	...	...	*2*	*2*	...	*1*	*10*
Puerperal Fever ... Cases	3	4	...	2	1	1	...	2	..	3	1	1	18
Puerperal Fever ... *Deaths*	...	*2*	*1*	*1*	...	*1*	...	...	*1*	*1*	*2*	*1*	*10*
Ophthal. Neonatorum—Cases	8	4	8	3	4	9	1	6	3	8	2	3	59
Malaria ..... Cases	...	1	1	...	1	..	..	...	1	...	...	...	4
Malaria ..... *Deaths*	...	...	*1*	...	...	...	...	...	...	...	..	...	*1*
†Infective Jaundice	...	...	...	...	...	...	...	...	...	...	...	..	...
B. Not Compulsorily Notifiable.													
‡Measles ..... Cases	209	337	295	123	124	137	14	16	11	27	20	9	1322
‡Measles ..... *Deaths*	*1*	*5*	*6*	*6*	*3*	*3*	*1*	*1*	...	...	*1*	...	*27*
German Measles ..... Cases	71	72	81	62	64	9	...	...	...	3	...	...	362
German Measles ..... *Deaths*	...	...	...	..	...	...	...	...	...	...	...	...	...
‡Whooping Cough..... Cases	291	181	144	84	78	63	15	33	13	13	11	7	933
‡Whooping Cough..... *Deaths*	*16*	*10*	*8*	*7*	*3*	*2*	*5*	...	*1*	...	..	*1*	*53*
Chicken Pox..... Cases	31	18	8	10	21	15	17	11	21	45	43	26	266
Chicken Pox..... *Deaths*	...	...	...	...	...	...	...	...	...	...	...	...	..
TOTAL ..... Cases	771	762	718	474	472	394	212	222	217	377	316	275	5210
TOTAL ..... *Deaths*	*45*	*36*	*49*	*36*	*23*	*32*	*32*	*18*	*22*	*26*	*20*	*23*	*362*
Influenza..... *Deaths*	*1*	*0*	*3*	*2*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*1*	*8*
Do. and Pneumonia, *do.*	*0*	*0*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*2*	*0*	*1*	*6*
Do. and Bronchitis, *do.*	*2*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*4*
Pneumonia ..... *Deaths*	*9*	*8*	*21*	*15*	*11*	*7*	*6*	*4*	*12*	*12*	*12*	*25*	*142*
Bronchitis ..... *do.*	*10*	*11*	*8*	*2*	*7*	*5*	*1*	*4*	*8*	*6*	*12*	*12*	*86*

* 1 case of paratyphoid. § Including 23 cases of paratyphoid. x All paratyphoid.

‡ Compulsorily notifiable from 1881 to 1903; now reported mainly by School Attendance Officers.

TABLE III.—ABERDEEN.—CASES OF INFECTIOUS DISEASES NOTIFED IN DIFFERENT SIZED HOUSES IN YEAR 1925.

DISEASE.	Number of Cases in Houses of					No. of Cases in Institutions, &c.	Case Rate per 1,000 Houses of				
	1 Room	2 Rooms	3 Rooms	4 Rooms	5 Rooms and upwards		1 Room	2 Rooms	3 Rooms	4 Rooms	5 Rooms and upwards
A. Compulsorily Notifiable.											
Small-pox,	...	...	...	...	1	...	...	...	...	...	0·2
Scarlet Fever,	62	300	172	60	74	44	19·6	22·7	16·3	14·3	14·7
Diphtheria,	30	172	96	36	34	64	9·4	13·0	9·1	8·6	6·7
Typhus Fever,	...	...	...	...	...	...	...	...	...	...	...
Typhoid or Enteric,	...	...	2	1	1	1	...	...	0·2	0·2	0·2
Paratyphoid "B,"	2	8	15	2	6	...	0·6	0·6	1·4	0·5	1·2
Dysentery,	...	1	3	2	...	9	...	0·1	0·3	0·5	...
Acute Poliomyelitis,	...	3	2	...	...	...	...	0·2	0·2	...	...
Epidemic Cerebro Spinal Meningitis,	...	1	...	...	...	...	...	0·1	...	...	...
Epidemic Encephalitis,	1	5	...	1	2	...	0·3	0·4	...	0·2	0·4
Acute Primary Pneumonia,	71	206	123	36	32	29	22·4	15·6	11·7	8·6	6·3
Acute Influenzal Pneumonia,	2	16	12	8	1	...	0·6	1·2	1·1	1·9	0·2
Pulmonary Tuberculosis.	26	102	60	19	8	12	8·2	7·7	5·7	4·5	1·6
Other Tuberculosis,	9	64	45	11	6	9	2·8	4·9	4·3	2·6	1·2
Erysipelas,	12	41	36	15	11	9	3·7	3·1	3·4	3·6	2·2
Puerperal Fever,	7	2	5	...	2	2	2·2	0·2	0·5	...	0·4
Ophthalmia Neonatorum,	25	23	6	2	2	1	7·8	1·7	0·6	0·5	0·4
Malaria,	...	1	...	1	1	1	...	0·1	...	0·2	0·2
B. Not Compulsorily Notifiable.											
Measles,	149	667	321	80	71	34	47·0	50·6	30·4	19·1	14·1
German Measles,	27	164	118	34	18	1	8·5	12·4	11·2	8·1	3·6
Whooping Cough,	141	532	195	41	23	1	44·4	40·3	18·5	9·8	4·5
Chicken Pox,	51	136	49	22	5	3	16·1	10·3	4·6	5·2	0·9
Total,	615	2444	1260	371	298	220	193·6	185·2	119·5	88·4	59·0

TABLE IV.—ABERDEEN.—MORBIDITY AND MORTALITY OF INFECTIOUS DISEASES DURING 1925.

(Distributed according to Ages and Wards of City.)

DISEASE.		No. of Cases and Deaths at various Age-Periods.						Cases and Deaths per 10,000 of Population in each Ward of City.*										
		Under 5 years	5-15 years	15-25 years	25-45 years	45+ years	All Ages.	Woodside.	St. Machar.	St. Andrew's.	St. Clement's.	Greyfriars.	St. Nicholas.	Rosemount.	Rubislaw.	Ruthrieston.	Ferryhill.	Torry.
Population (in thousands), Census 1921		...	...	...	...	...	...	9·5	14·3	17·6	11·2	13·7	14·5	16·6	19·0	16·4	14·7	11·3
A. Compulsorily Notifiable.																		
Small-pox	Cases	...	..	...	...	1	1	...	...	...	0·9	...	...	...	..	...	...	...
	Deaths	...	...	...	...	...	...	...	..	...	..	...	...	...	...	...	...	...
Scarlet Fever	Cases	198	404	70	35	5	712	46	49	62	53	42	44	54	35	24	46	40
	Deaths	*8*	*6*	...	...	*1*	*15*	..	...	*1*	*3*	...	*0·7*	...	*1*	*0·6*	*0·7*	*4*
Diphtheria	Cases	129	207	69	26	1	432	16	43	35	59	31	24	27	8	26	12	26
	Deaths	*15*	*6*	*1*	..	...	*22*	*1*	*1*	*0·6*	*4*	*3*	*2*	*2*	...	*1*	...	*2*
Typhus Fever	Cases	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Deaths	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Typhoid and Paratyphoid	Cases	4	14	12	6	4	40	24	1	1	...	0·7	3	1	...	1	3	..
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dysentery	Cases	4	7	...	3	1	15	1	...	5	0·9	...	..	0·6	...	2	...	0·9
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Acute Poliomyelitis	Cases	2	3	...	...	...	5	...	1	..	...	...	0·7	0·6	0·5	...	...	0·9
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Epidemic Cerebro Spinal-Meningitis	Cases	1	...	...	...	...	1	...	..	...	...	...	..	0·6	...	...	...	...
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Epidemic Encephalitis	Cases	...	3	3	1	2	9	1	...	...	0·9	...	0·7	2	...	0·6	0·7	...
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Acute Pneumonia—																		
(*a*) Primary	Cases	200	89	58	65	85	497	42	24	37	54	66	37	19	21	17	12	32
	Deaths	*54*	*2*	*1*	*4*	*41*	*102*	*2*	*5*	*8*	*12*	*15*	*0·7*	*4*	*9*	*0·6*	*3*	*3*
(*b*) Influenzal	Cases	8	8	5	5	13	39	1	6	2	0·9	0·7	1	4	1	2	3	4
	Deaths	...	...	...	...	*6*	*6*	*1*	...	*0·6*	...	...	..	*0·6*	...	*0·6*	*1*	...
Tuberculous Diseases—																		
(*a*) Respiratory	Cases	12	40	38	90	47	227	21	15	18	11	25	13	16	6	11	12	14
	Deaths	*1*	*2*	*33*	*74*	*44*	*154*	*10*	*7*	*11*	*8*	*13*	*10*	*10*	*7*	*9*	*12*	*9*
(*b*) Other	Cases	48	53	20	13	10	144	9	10	9	8	15	10	9	7	9	10	4
	Deaths	*22*	*9*	*5*	*4*	*3*	*43*	*3*	*3*	*1*	*3*	*5*	*7*	*4*	*3*	*3*	*3*	*3*
Erysipelas	Cases	13	7	12	24	68	124	5	8	11	8	13	12	10	2	5	4	10
	Deaths	*5*	...	...	...	*4*	*9*	...	*1*	*0·6*	...	*2*	*2*	...	*0·5*	...	...	...
Puerperal Fever	Cases	...	...	6	12	...	18	1	1	0·6	2	4	1	...	0·5	2	...	0·9
	Deaths	...	...	*2*	*8*	...	*10*	*1*	*1*	...	*0·9*	*0·7*	*1*	*0·6*	...	*1*	...	*0·9*
Ophthalmia Neonatorum	Cases	59	...	..	...	...	59	1	4	3	6	9	3	5	...	2	2	6
Malaria	Cases	...	...	1	3	...	4	...	..	...	...	...	0·7	0·6	0·5	...	...	0·9
	Deaths	...	...	...	*1*	...	*1*	...	...	...	...	...	*0·7*	...	...	...	...	..
B. Not Compulsorily Notifiable																		
Measles	Cases	498	808	14	1	1	1322	89	120	62	65	94	92	109	47	80	82	85
	Deaths	*23*	*4*	...	...	...	*27*	*2*	*1*	*2*	*2*	*4*	*1*	*2*	...	*2*	*1*	*2*
German Measles	Cases	63	291	6	2	...	362	16	39	31	18	21	21	23	13	27	20	18
	Deaths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Whooping Cough	Cases	602	330	...	1	...	933	88	72	60	62	84	97	76	23	37	34	31
	Deaths	*53*	...	...	...	...	*53*	*2*	*2*	*5*	*6*	*6*	*5*	*3*	*2*	*1*	*2*	*3*
Chicken Pox	Cases	108	151	5	2	..	266	19	17	28	23	34	21	16	6	8	8	7
	Deaths	...	...	...	..	...	..	...	...	...	..	...	...	...	...	...	...	...
Total	Cases	1949	2415	319	289	238	5210	380	410	365	373	439	381	373	171	254	249	281
	Deaths	*181*	*29*	*42*	*91*	*99*	*442*	*22*	*21*	*30*	*39*	*49*	*30*	*26*	*23*	*19*	*23*	*27*

* Deaths occurring in Hospitals are assigned to the Ward of the City from which the cases were originally removed.

TABLE V.—ABERDEEN.—MORBIDITY AND MORTALITY OF INFECTIOUS DISEASES

(Excluding Tuberculosis)

DURING EACH YEAR FROM 1915 TO 1925.

(Not corrected for transferred deaths.)

DISEASE.		1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	ANNUAL AVERAGE 1915 to 1924.	ANNUAL AVERAGE 1905 to 1914.
A. Compulsorily Notifiable.														
Small-pox,	No. of Cases, ...	1	1	1	0	0	0	0	8	0	0	0	1·0	0·7
	No. of Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0·0	0·1
	Percent. of Deaths	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0·0	14·3
Scarlet Fever, ...	No. of Cases, ...	712	197	271	310	706	409	270	290	283	917	1873	552·6	884·4
	No. of Deaths, ...	15	3	4	9	8	4	4	3	11	27	142	21·5	23·0
	Percent. of Deaths	2·1	*1·5*	*1·5*	*2·9*	*1·1*	*1·0*	*1·5*	*1·0*	*3·9*	*2·9*	*7·6*	4·1	2·6
Diphtheria,	No. of Cases, ...	432	286	189	292	733	560	561	357	338	572	675	456·3	631·2
	No. of Deaths, ...	22	11	8	14	36	29	32	21	18	34	51	25·4	44·3
	Percent. of Deaths	5·1	*3·8*	*4·2*	*4·8*	*4·9*	*5·2*	*5·7*	*5·9*	*5·3*	*5·9*	*7·5*	5·6	7·0
Typhus Fever, ...	No. of Cases, ...	0	0	0	0	0	0	0	0	0	0	0	0	10·1
	No. of Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	1·4
	Percent. of Deaths	0	*0*	*0*	*0*	*0*	0	*0*	*0*	*0*	*0*	*0*	0	13·9
Typhoid and Para-typhoid,	No. of Cases, ...	40	9	21	8	7	8	23	102	1	10	13	20·2	33·9
	No. of Deaths, ...	0	1	3	0	0	2	5	14	1	2	1	2·9	5·3
	Percent. of Deaths	0	*11·1*	*14·3*	*0*	*0*	*25·0*	*21·7*	*13·7*	*100*	*20·0*	*7·7*	14·4	15·6
†Dysentery,	No. of Cases, ...	15	2	0	6	24	17	7	...	...	...	...	...	...
	No. of Deaths, ...	0	0	0	1	7	4	0	...	..	...	...	...	...
*Acute Polio-myelitis,...	No. of Cases, ...	5	6	0	9	8	5	1	2	10	79	2	12·2	...
	No. of Deaths, ...	0	0	0	0	2	0	1	1	0	4	0	0·8	...
Epidemic Cerebro-Spinal Meningitis,	No. of Cases, ...	1	4	5	3	5	3	12	4	2	5	19	6·2	4·4
	No. of Deaths, ...	0	3	3	2	3	1	10	4	2	2	14	4·4	2·7
‡Epidemic Encephalitis	No. of Cases, ...	9	7	0	0	3	...	...	...	...	...	...	...	...
	No. of Deaths, ...	0	3	0	0	1	...	...	...	...	...	...	...	...
†Acute Pneumonia, Primary,	No. of Cases,..	497	383	335	404	354	393	109	...	...	..	...	...	...
	No. of Deaths,	102	121	107	179	131	190	50	...	...	...	...	...	...
Influenzal,	No. of Cases,..	39	77	17	141	56	87	15	...	...	...	..	...	...
	No. of Deaths,	6	29	6	64	10	32	1	...	...	...	...	...	...
Erysipelas,	No. of Cases, ...	124	92	110	110	170	158	141	102	129	125	198	133·5	200·7
	No. of Deaths, ...	9	4	4	11	4	6	2	6	9	4	7	5·7	5·8
Puerperal Fever, ...	No. of Cases, ...	18	15	15	16	13	13	10	8	12	11	11	12·4	11·4
	No. of Deaths, ...	10	8	8	13	6	5	1	6	8	5	8	6·8	6·6
*Ophthalmia Neonatorum	No. of Cases, ...	59	69	63	47	100	112	99	39	42	40	40	65·1	...
†Malaria, ...	No. of Cases, ...	4	3	3	5	55	138	77	..	...	...	...	...	...
	No. of Deaths, ...	1	0	0	0	1	1	0	...	...	...	..	...	...
†Trench Fever, ...	No. of Cases, ...	0	0	0	0	0	2	4	...	...	...	...	...	...
	No. of Deaths, ..	0	0	0	0	0	0	0	...	...	...	...	..	...
¶Infective Jaundice		0	0	..	...	...	...	...	...	...	...	...	...	...
B. Not Compulsorily Notifiable.														
‖Measles, ...	No. of Cases, ...	1322	1488	594	3684	44	1072	306	788	1800	183	1750	1170·9	1224·8
	No. of Deaths, ...	27	56	41	142	2	41	2	43	86	10	147	57·0	55·9
	Percent. of Deaths	2·0	*3·8*	*6·9*	*3·9*	*4·5*	*3·8*	*0·7*	*5·5*	*4·8*	*5·5*	*8·4*	4·9	4·6
German Measles,	No. of Cases, ...	362	111	2	11	4	73	42	21	357	9	4	63·4	...
	No. of Deaths, ...	0	0	0	0	0	0	0	1	2	0	0	0·3	...
‖Whooping Cough, ...	No. of Cases, ...	933	1712	87	1444	305	325	713	777	956	307	1068	769·4	688·3
	No. of Deaths, ...	53	71	5	101	2	28	31	54	48	29	70	43·9	57·3
	Percent. of Deaths	5·7	*4·1*	*5·7*	*7·0*	*0·7*	*8·6*	*4·3*	*6·9*	*5·0*	*9·4*	*6·6*	5·7	8·3
§Chicken Pox, ...	No. of Cases, ...	266	318	255	46	725	256	...	...	...	...	...	...	...
	No. of Deaths, ...	0	0	1	0	3	0	...	...	...	...	...	...	...

* Notification commenced May, 1913. † Notification commenced Aug., 1919. ‡ Notification commenced Aug., 1921.
§ Compulsorily notifiable from May, 1920, to Sept., 1921, and from July to December, 1923.
¶ Compulsorily notifiable from 26th December, 1924. ‖ Compulsory notification ceased February, 1903.

TABLE VI.—ABERDEEN.—STATEMENT OF NUMBER OF DECLARATIONS OF CONSCIENTIOUS OBJECTION TO VACCINATION.

Year.	Registered Births.	Deaths before Vaccination	Survivors.	Conscientious Objectors.	Percentage.	Year.	Registered Births	Deaths before Vaccination.	Survivors.	Conscientious Objectors.	Percentage.	Year.	Registered Births.	Deaths before Vaccination	Survivors.	Conscientious Objectors.	Percentage.
1907	4504	470	4034	84	2·1	1913	3872	467	3405	491	14·4	1919	3481	357	3124	357	11·4
1908	4450	511	3939	219	5·6	1914	4041	481	3560	413	11·6	1920	5010	500	4510	290	6·4
1909	4492	526	3966	339	8·5	1915	3837	483	3354	412	12·3	1921	4326	457	3869	364	9·4
1910	4300	448	3852	362	9·4	1916	3627	401	3226	345	10·7	1922	4038	398	3640	348	9·6
1911	4028	478	3550	406	11·4	1917	2966	326	2640	347	13·1	1923	3847	317	3530	305	8·6
1912	4152	511	3641	478	13·1	1918	2817	351	2466	260	10·5	1924	3527	352	3175	246	7·7

total number of cases recorded for the year was 712, with a case-mortality of 2·1 per cent. During the 1915-1924 decennium the average yearly number of cases was 553 and the case-mortality 4·1.

Diphtheria.

Diphtheria showed an increase in prevalence in 1925 as compared with 1924, there being 432 cases, as against 286 in 1924. The case-mortality for 1925 was 5·1 per cent., as against 3·8 in 1924. The annual average number of cases during the 1915-1924 decennium was 456, with a case-mortality of 5·6 per cent.

In order to discover possible diphtheria carriers and such cases in infected households as had not been recognised on account of the absence of clinical symptoms, swabbings from the throat and nose, for bacteriological examination, have continued to be taken from the contacts in all houses in which definite cases had been notified. In the cases thus examined, 0·6 per cent. of the swabbings gave a positive finding bacteriologically. During the 1915-1924 decennium the percentage of positive swabbings averaged 3·5.

Susceptibility Tests and Active Immunisation against Diphtheria and Scarlet Fever.

Schick testing and active immunisation of the nursing staff of the City Hospital against diphtheria was inaugurated in January, 1922, and the results of this prophylaxis are recorded in Chapter I. of this Report in the paper relating to "The Newer Knowledge of Scarlet Fever and Diphtheria."

Dick testing and active immunisation of the nursing staff of the City Hospital against scarlet fever was inaugurated in June, 1925, and the results of this prophylaxis are similarly recorded in Chapter I. of this Report.

Sanction to provide active immunisation against both diphtheria and scarlet fever to the community generally was given by the Town Council on 19th October, 1925, and similar sanction to provide active immunisation throughout the schools of the City was granted by the Education Authority on 27th November, 1925. The results of these immunising efforts to date are recorded in Chapter I.

The following table relates to the immunisation services provided by the staff of the Health Department for the year 1925 alone:—

Diphtheria and Scarlet Fever—Susceptibility Tests and Active Immunisation by City Health Department. Year 1925.

	City Hospital.				Child Welfare Centres.	Schools.		Out-Patients.	
	Nurses.		In-Pats.						
	Pos.	Neg.	Pos.	Neg.		Pos.	Neg.	Pos.	Neg.
Schick Tests,	38	100	407	38	—	206	50	101	56
Dick Tests,	44	94	—	—	—	207	64	83	69
Diphtheria Prophylactic Injections,	80		1,187		—	55		77	
Scarlatina Prophylactic Injections,	52		—		—	68		51	
Combined Diphtheria and Scarlatina Prophylactic Injections	9		6		545	261		978	

In addition to the immunising services provided by the staff of the Health Department, as recorded in full in Chapter I. of this Report, medical practitioners of the City have, since the inauguration of the community immunising campaign, carried out a total of 294 Schick tests and 1,039 Dick tests. They have immunised a total of 125 persons with the diphtheria prophylactic, 263 persons with the scarlatina prophylactic, and 1,780 persons with the combined diphtheria and scarlatina prophylactic.

Typhoid and Paratyphoid Fevers.

Five cases of typhoid fever were reported in 1925, none of which ended fatally. In the preceding decennium there was an annual average of 20 cases and 3 deaths.

There was no known association between any of the cases. In one of the cases, a girl aged 10 years, the infection was contracted from a carrier case in the County. In the other four cases the source of infection was not determined.

Thirty-five cases of paratyphoid fever were notified in 1925, none of which ended fatally. Details of the outbreak due to *B. paratyphosus* B which occurred in August, 1925, and caused 21 Aberdeen cases are given in Chapter I. of this Report dealing with special investigations, including the investigation of special epidemics of disease. Of the remaining 14 cases, 5 proved to be contact cases from this outbreak. Of the remaining 9 cases, 2 contracted the infection while on holiday in Fifeshire, 1 contracted the infection in Ireland, and the source of the infection was not determined in 6 cases.

Venereal Diseases.

A detailed analysis of cases of venereal diseases which have come to the knowledge of the Health Department is given in the section of this Report dealing with the Venereal Diseases Services. During the year, there were 111 fresh cases of syphilis, 341 of gonorrhœa, 3 of soft chancre, and 5 of mixed infection.

Ophthalmia Neonatorum.

This disease was responsible for 59 cases during 1925, as compared with an average annual number of 65 during the preceding ten years.

DISEASES SPREAD BY DISCHARGES FROM THE MOUTH AND NOSE.

Measles.

The number of cases of measles coming to the knowledge of the Health Department in 1925 was 1,322, the average yearly number of cases during the 1915-1924 decennium being 1,171. This disease had begun to assume epidemic prevalence in December, 1924. The epidemic attained its greatest height in February, 1925, when 337 cases were brought to the knowledge of the Department. The case-mortality was 2·0 per cent., as against an average of 4·9 for the preceding ten years. The deaths during 1925 were mainly confined to children under five years of age.

Whooping Cough.

The number of cases of whooping cough coming to the knowledge of the Health Department was 933, with 53 deaths, giving a case-mortality of 5·7 per cent. An epidemic of this disease which commenced in August, 1924, continued throughout the first quarter of 1925. Its greatest height, as regards cases, was attained in November, 1924, when 333 cases were discovered. The average annual number of cases during the 1915-1924 decennium was 769, the percentage of deaths being similar to that of 1925, namely, 5·7.

German Measles.

This disease appeared in epidemic form in the earlier months of the year. In all, 362 cases were brought to the knowledge of the Health Department, as against 111 in 1924, and an average of 63 during the 1915-1924 decennium. There were no deaths.

Influenza.

Influenza is not a compulsorily notifiable disease, apart from influenzal pneumonia. Influenza (apart from influenzal pneumonia) was registered as the cause of 12 deaths during 1925, as against 25 deaths in 1924. There was no epidemic prevalence of this disease in 1925.

Acute Primary and Influenzal Pneumonia.

There were 497 cases of primary pneumonia notified in 1925, with 102 deaths. Of influenzal pneumonia, there were 39 cases, with 6 deaths.

Meningococcic Meningitis.

One case of this disease was notified in a female child aged 3 years. The source of the infection was not determined, the contacts being bacteriologically examined with negative results. During the preceding ten years, the average annual number of cases was 6·2, and the average annual number of deaths 4·4.

Acute Poliomyelitis.

Five cases of this disease were notified to the Health Department. There was no association between any of the cases, nor was the source of infection determined in any case.

Epidemic Encephalitis.

Of this disease, 9 cases were reported, none of which proved fatal. The symptoms of para-encephalitis were serious in 6 of the cases, but, both in the early and later stages, the symptoms of the disease during 1925 were less grave than in the years 1918-24. In 1924, 7 cases were notified, with 3 deaths.

Tuberculosis.

As was stated in the 1924 Report, many investigations have shown that only about 1 per cent. of cases of pulmonary and generalised tuberculosis in man are due

to the bovine type of the bacillus, whereas in some 66 per cent. of tuberculosis of the glands, in 50 per cent. of abdominal tuberculosis, in 50 per cent. of tuberculosis of the skin, in 25 per cent. of tuberculosis of the bones and joints, in 20 per cent. of tuberculosis of the meninges, and in 18 per cent. of genito-urinary tuberculosis, the infection is of the bovine type. Applying these proportions to the various forms of tuberculosis notified in Aberdeen, it is found that of the 371 cases notified in 1925, 303, or 82 per cent., were infections with the human type of tubercle bacilli, and that 68, or 18 per cent., were infections with bovine type bacilli. Similarly, of 197 deaths in Aberdeen from all forms of tuberculosis in 1925, it is estimated that 183, or 93 per cent., of these deaths were due to tubercle bacilli of the human type, and that 14, or 7 per cent., were due to bovine type bacilli.

A detailed analysis of the cases and deaths from tuberculosis in Aberdeen is given in the section of this Report relating to the Tuberculosis Services.

Chicken-pox.

This disease was not compulsorily notifiable during 1925, but during the year 266 cases were brought to the knowledge of the Health Department. There were no deaths.

DISEASES SPREAD BY THE EXCRETA.

Typhoid and Paratyphoid Fevers.

These diseases have already been referred to under the group of diseases for which there is a specific prevention.

Dysentery.

During 1925, there were 15 cases of dysentery notified, of which 8 proved to be infections with the Sonne bacillus, 5 with the Flexner bacillus, and 2 with cysts of Entamœba histolytica. A full account of the incidence of dysentery in Aberdeen in recent years is contained in Chapter I. of this Report.

DISEASES SPREAD BY CUTANEOUS INOCULATION.

Erysipelas.

During 1925, there were 124 cases of this disease reported, with 9 deaths. In the 1915-24 decennium, the average annual number of cases was 134, and the deaths 6.

Scabies.

A record of the number of cases of other inflammatory affections of the skin, including scabies, receiving treatment at the Skin Department of the City Hospital is given in the section of this Report dealing with City Hospital Services.

DISEASES ASSOCIATED WITH CHILD-BIRTH.

Puerperal Fever.

During 1925, there were 18 cases of puerperal fever, with 10 deaths; the average annual numbers of cases and deaths during the preceding quinquennium being 14 and 8 respectively.

In 1925, maternal deaths were 6·2 per 1,000 births, corrected for transfers, and of these the deaths from sepsis were 2·7 per 1,000 births. In the 1920-1924 quinquennium, the yearly average of maternal deaths was 6·7 per 1,000 births, the deaths from sepsis averaging 1·8 per 1,000 births.

Ophthalmia Neonatorum.

Ophthalmia neonatorum has already been referred to under the section of the Report dealing with diseases for which a specific prophylaxis is available.

INSECT-BORNE DISEASES.

Typhus Fever, Trench Fever, Infective Jaundice.

No cases during 1925.

Malaria.

Four cases were reported, all of which contracted the infection abroad. One of the cases developed blackwater fever and died, and cases of blackwater fever are sufficiently rare in this country to warrant the case being recorded with some detail.

The patient, 28 years of age, was a native of the Outer Hebrides. In 1916, he served in the army in Gallipoli and contracted malaria. No record could be obtained of the type of infection, but the disease does not appear to have been severe. After demobilisation, he obtained an appointment in Nigeria, his employment entailing much travelling about the country. He left Nigeria for this country on 4th November, 1924, apparently in good health. From 1916 to 1924, he had kept a record of his malarial attacks, which he reckoned to number 25, none being of special severity. He was certain that he had never shown any manifestations of blackwater fever during that period. He resided in Lewis on his return to this country, and set out to return to the west coast of Africa early in March, 1925. Arriving in Aberdeen during a snowstorm, he lodged in an hotel, where the present illness developed suddenly on 12th March. The onset was marked by rigor followed by irregular fever with marked bilious symptoms. On the first day, he took 15 grains of quinine sulphate by mouth, but this was not retained. On the following day, he was alarmed to find that he was passing very dark coloured urine, the symptoms becoming worse, and he was admitted to hospital on 14th March. On admission, the temperature was 100° F. and the pulse 88. The tongue had a febrile appearance. Some epigastric distress was present, and vomiting of a bilious type was severe and prompt after any attempt to swallow fluids. Splenomegaly was present, the organ being just palpable, while the liver appeared to be normal in size. The skin and sclerotics showed a marked saffron yellow tint. On the day of admission, and on the following day, he passed a few ounces of urine of almost a mahogany colour. Constipation was present. All the symptoms increased in severity until the 16th March, after which he became almost comatose. The vomiting was particularly severe, necessitating the use of

a small amount of opium. The only fluid tolerated for any time by mouth was iced champagne, so that frequent rectal and intravenous administration of normal saline was a necessity. No urine was voided after the 15th March, and constipation defied all attempts to procure a movement of the bowel. Slight convulsions developed on the 22nd March, rapidly terminating in death on the same day.

Blood films failed to reveal the presence of malarial parasites. The red cells showed no abnormality. The white cell count was as follows:—polymorphonuclear cells 74 per cent., large mononuclear cells 13 per cent., small pymphocytes 11 per cent., eosinophil cells 1 per cent., transitional cells 1 per cent. The faeces showed no pathological bacteria or protozoa. The urine, the colour of which has already been referred to, was very albuminous, and showed a large deposit of granular material. Blood corpuscles were entirely absent, and spectroscopic examination gave the characteristic bands of oxyhaemoglobin.

It is to be noted in passing that the most recent theory of the causation of blackwater fever is that the disease is due to repeated attacks of *Plasmodium falciparum*. Observations on the hæmolytic problem show that the condition strongly resembles the phenomena produced by the action of a specific serum hæmolysin, and the altered chemical composition of the red cells as seen in infections with *P. falciparum* in Rhodesia suggests the mode by which a specific autolytic substance is produced. This hæmolytic amboceptor would tend to act only on cells so altered. (Researches on Blackwater Fever by J. G. Thomson—London School of Tropical Medicine, Research Memoir Series, Vol. VI , 1924.)

CHAPTER IV.

ENVIRONMENTAL CONDITIONS.

ATMOSPHERIC CONDITIONS.

Weather and Disease.—In Table VII. is summarised the state of the weather in Aberdeen for each month throughout the year under review, along with the average for the twenty-five years 1897-1921.

As regards sunshine, the month which enjoyed the most sunshine was June with 180 hours for the whole month, or six hours a day; while the month with the least sunshine was December, with 39 hours, for the whole month, or one hour a day. The total amount of sunshine for the year under review was very slightly below the average for the years 1897-1921.

December was the coldest month, with a temperature of 34·2° F., the warmest month being July, with a temperature of 58·3°. The difference in temperature between the coldest and warmest months was 23·4, which was above the average for the years 1897-1921 (17·5°). The mean temperature for the whole year was 46·1°, the average for preceding years being 47·2°. The mean daily range of temperature, or the difference between the highest and lowest for the day, averaged 9·5 in 1925. The daily range was greatest on the average from March to October, with monthly means of 8·5 to 12·2, and least in December, with 7·7.

During 1925, the driest month was June, with 0·9 inches of rainfall, while February was the wettest, with fully four times that amount of rain. The total amount of rainfall during the year is lower than the average for preceding years.

In 1925, the most prevalent winds in Aberdeen were from north-west and south, the least prevalent being north-easterly winds.

HOUSING CONDITIONS.

A comprehensive review of the housing situation in Aberdeen was given in my Annual Report for 1922-23, together with a statement of the action taken by the Town Council in endeavouring to provide additional houses for the working classes and to clear slum areas.

The housing situation in Aberdeen as at 31st December, 1925, is dealt with in considerable detail by the Sanitary Inspector in his Annual Report for 1925. In particular, he refers to the habitability of existing dwellings and the action taken to deal with defective or uninhabitable dwellings, and with overcrowding and the inability to prevent overcrowding owing to the dearth of houses.

New Houses Provided under Housing Schemes.—The total number of houses constructed or about to be constructed under any of the Housing Schemes is as follows:—

Two-roomed.	Three-roomed.	Four-roomed.	Total.
287	527	154	968

This number is proportionately much smaller than in any of the larger cities in Scotland.

TABLE VII.—ABERDEEN.—METEOROLOGICAL RECORD FOR EACH MONTH (From King's College Observatory).

YEAR 1925.

MONTH.	BAROMETRIC PRESSURE (at 32° F. and Sea Level).			TEMPERATURE OF ATMOSPHERE.				Mean Daily Temp. of Ground (4 feet below surface)	Relative Humidity. Sat.=100.	RAIN-FALL		SUNSHINE.		*WIND.								
														DIRECTION; AND DURATION IN HOURS.								Velocity
	Absolute Highest	Absolute Lowest.	Mean Daily Range.	Absolute Highest	Absolute Lowest.	Mean Daily Temp.	Mean Daily Range			Duration.	Amount	Duration.	Percentage of possible Sunshine.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm †	Average No. miles per day.
	Inches.	Inches.	Inches.	°F.	°F.	°F.	°F.	°F.		Hours.	Inches.	Hours.										
January, .	30·82	28·40	0·35	51·8	28·9	40·6	7·9	42·1	83	44	1·4	48	21	1	...	2	52	248	231	142	60	8	277
February, .	30·21	28·52	0·30	49·6	28·4	39·4	7·9	40·7	82	151	3·8	68	24	43	38	39	77	125	143	93	94	20	334
March, . .	30·60	29·29	0·25	52·7	27·9	39·8	9·7	40·9	79	127	1·9	109	28	118	14		5	32	69	208	286	10	265
April, . .	30·35	29·20	0·25	53·2	28·2	42·8	9·9	42·9	80	107	2·3	157	37	48	51	54	97	146	106	107	90	21	265
May, . .	30·29	28·99	0·19	62·6	33·1	49·4	8·5	47·1	84	110	2·9	161	32	80	85	111	84	216	81	39	36	12	246
June, . .	30·47	29·76	0·12	73·8	43·9	54·5	12·2	52·0	75	32	0·9	180	34	86	22	21	50	145	76	36	222	62	250
July, . .	30·34	29·45	0·15	75·9	49·3	58·3	10·4	55·0	84	90	3·1	146	27	52	80	77	89	136	38	63	128	81	159
August, .	30·42	29·55	0·15	71·1	42·1	56·7	11·1	56·0	80	51	1·1	128	27	61	44	53	58	153	92	103	136	44	185
September, .	30·30	28·99	0·22	64·8	39·9	50·5	10·3	53·4	81	108	2·6	108	28	44	15	17	13	101	117	137	249	27	240
October, . .	30·49	28·36	0·25	63·0	32·4	48·2	10·3	50·3	83	98	2·7	114	36	44	2	3	10	185	116	122	170	53	216
November, .	30·60	29·35	0·24	53·4	27·5	38·5	8·5	46·0	83	130	1·8	79	33	39	24	18	23	47	125	188	234	22	220
December, .	30·52	28·58	0·24	48·6	20·3	34·9	7·7	40·8	84	163	1·9	39	19	26	6	25	9	103	117	147	294	17	264
Monthly Average	30·45	29·04	0·23	60·0	33·5	46·1	9·5	47·3	82	10·1	2·2	111	29	54	32	35	51	136	109	115	167	31*	243
Total for Year, .	...	...	...	...	...	...	...	...	...	1211	26·4	1328	...	642	381	422	606	1637	1311	1385	1999	377	...

AVERAGE FOR TWENTY-FIVE YEARS, 1897-1921.

January, .	30·54	28·81	0·31	52·0	26·1	38·7	7·7	40·4	80	86	2·1	43	19	23	10	21	85	165	202	144	94	0·1	242
February, .	30·49	28·85	0·28	52·0	24·8	38·9	8·3	39·6	80	76	1·8	73	28	24	17	25	65	171	148	126	101	...	229
March, .	30·35	28·88	0·26	55·1	26·7	40·1	9·1	40·1	78	103	2·3	109	30	47	31	47	95	142	137	120	124	0·2	239
April, . .	30·47	29·04	0·23	60·1	30·3	43·3	10·2	42·2	78	84	2·0	157	38	50	45	51	96	147	96	110	126	0·1	217
May, . .	30·44	29·24	0·19	66·7	34·7	48·0	11·1	45·8	78	83	2·4	183	37	74	57	84	134	149	73	69	104	0·9	189
June, . .	30·38	29·42	0·16	69·9	39·3	52·9	11·3	50·4	77	64	1·7	183	35	73	59	79	111	131	74	67	133	0·4	181
July, . .	30·34	29·40	0·16	72·6	43·2	56·2	10·9	53·2	78	75	2·8	154	29	65	49	82	107	133	80	83	144	1·9	163
August, . .	30·29	29·31	0·17	71·6	42·4	55·6	10·7	54·3	80	76	2·6	141	31	48	47	67	103	151	100	96	133	1·3	164
September, .	30·42	29·22	0·20	67·8	38·4	53·0	11·0	53·0	80	72	2·1	125	33	36	24	39	87	173	119	114	129	0·5	181
October, . .	30·44	29·06	0·24	61·3	32·9	47·9	9·3	50·3	82	101	2·8	91	29	34	22	38	104	195	128	108	75	0·3	211
November, .	30·46	28·84	0·26	55·5	27·1	42·5	8·2	46·3	82	102	2·8	55	23	26	9	24	69	164	164	155	107	0·1	228
December, .	30·40	28·75	0·30	52·7	24·8	39·6	7·8	42·7	82	115	3·3	36	18	20	8	26	76	173	198	155	92	0·1	234
Monthly Average	30·42	29·07	0·23	61·4	32·6	47·2	9·6	46·5	80	86	2·4	113	29	43	32	49	94	158	127	112	114	0·5	207
Total for Year, .	...	...	...	...	...	...	...	...	...	1037	28·7	1350	...	520	378	583	1132	1894	1519	1347	1362	5·9	...

* To indicate the dominant direction, every duration of 100 hours and upwards is in thick figures. The wind data are now obtained from a new pressure-tube anemograph erected in a more open exposure than that of the previous instrument. The values obtained under the new conditions exceed the previous values by about 20 per cent.

† "Calms" now include actual calms and occasions of fluctuating light winds. Previously only flat calms were entered as "calms."

The following details regarding the above 968 houses are submitted:—

Under the Torry Scheme.—242 houses have been erected under the 1919 Act. A few of these houses are not yet ready for occupation.

Twenty three-roomed houses are, under the Housing Act, 1924, also being erected at Torry.

Under the Hilton Scheme.—300 three-apartment houses are in course of construction, and a number of these are already occupied. The contractors are under an obligation to complete the whole contract by August, 1927.

An additional 40 three-apartment houses, constructed of timber, are also in course of erection at Hilton.

Under the Cattofield Scheme.—48 two-roomed houses have been erected at Cattofield. These houses were originally intended for the use of occupants to be displaced by the Slum Clearance Scheme, but were subsequently transferred to a Scheme under the 1923 Act.

Slum Clearance Scheme.—Plans of 318 houses that will be required to house the tenants displaced from the insanitary areas have been passed by the Town Council and approved by the Board of Health, but the building of these houses has not yet commenced.

Scheme of Slum Improvement.—The Slum Improvement Scheme of the Town Council relating to the Guestrow, Shoe Lane, and Shuttle Lane areas has been fully described in preceding Annual Reports. The local inquiry by the Scottish Board of Health in connection with the scheme was held in Aberdeen on the 8th to 11th June, 1926, by Mr. Maconochie, the Commissioner appointed by the Board of Health. Prior to the holding of the inquiry, the Town Council had succeeded in coming to an agreement with certain proprietors whereby the Council acquired by purchase not only a considerable extent of slum property scheduled under the Scheme but also a considerable amount of valuable property in the area adjacent to the slum area, and the acquisition by the Town Council of these properties will greatly facilitate an important City Improvement Scheme that is under contemplation.

In terms of a letter from the Scottish Board of Health, dated 28th July, 1926, the Board have approved the Slum Clearance Scheme and are prepared to make an Order confirming the Scheme. Under the Scheme the houses in the slum areas will require to be demolished within a period of five years.

Uninhabitable Dwellings Outwith the Slum Clearance Scheme Area.—According to a survey made in December, 1922, and since revised, it is found that there are 1,500 houses in the City which are unfit for human habitation and which can be closed by Order of the Town Council whenever alternative accommodation is available.

Overcrowding.—The overcrowding of houses is, as is to be expected, increasing annually, and may now be said to have assumed alarming dimensions, both in extent and degree.

Prior to 1918, overcrowding which could not be abated was practically unknown in the City. Since that date up to the end of 1925, there are known to be 680 houses in which it has been *impossible to abate* the overcrowding. In 200 of these houses the excess is *more* than two adults. It is estimated, therefore, that at least 1,000 additional houses are immediately required to relieve overcrowding.

Number of Houses Required in Aberdeen to Meet the Immediate Needs of the City.—The City Chamberlain has on his books the names of 700 persons who require houses at Hilton. For Torry houses there are still 200 names on the list. The Town Council's Factor has also a waiting list of 300 names in connection with the old properties which belong to the Corporation.

There are thus on the books of the Town Council alone the names of 1,200 applicants for new houses; the circumstances of these 1,200 applicants have been investigated, and it is found that all the applicants are either living in overcrowded houses, in furnished lodgings or sub-let rooms, or are persons who intend to be married as soon as they can find a house. In addition to the names of the 1,200 applicants on the Town Council's books, every house factor in the City has a large waiting list, but these lists are no measure of the number of persons who require houses, since the majority of the factors have ceased adding further names to their lists during 1926.

In order to obtain a more accurate measure of the number of houses required in the City, an intensive survey of the tenemented houses of the City of Aberdeen has been made by the staff of the Health Department, and reference to the following table shows that there is a total of 1,991 families living in sublet houses, all of which families are desirous of obtaining houses for themselves.

Number of Sub-let Houses in Dwelling-houses situated in Tenement Properties in the various Wards of the City.

Ward.	Size of House.				Total Number of Houses.	Number of Additional Families.
	One Room.	Two Rooms.	Three Rooms.	Upwards of Three Rooms.		
Ruthrieston, . . .	78	1,159	1,183	338	2,963	205
Rubislaw, ...	95	889	993	373	2,433	83
Rosemount, . . .	180	1,493	1,203	450	3,494	168
St. Nicholas, . . .	448	1,237	913	400	3,263	265
St. Machar, . . .	243	1,334	795	413	2,893	108
Woodside, . . .	141	672	675	288	1,885	109
Ferryhill, ...	186	990	873	564	2,855	242
Torry, ...	52	1,072	980	121	2,972	247
St. Clement's, . . .	427	933	564	173	2,286	189
St. Andrew's, . . .	265	1,920	1,267	442	4,131	237
Greyfriars, . . .	702	1,115	625	206	2,786	138
Total, ...	2,817	12,814	10,071	3,768	31,961	1,991

It can, therefore, be accepted that there are at least 2,500 houses required to accommodate persons living in sub-let houses or furnished apartments or otherwise who desire a house.

Immediate Housing Requirements.—The *immediate housing requirements* of the City can, therefore, be summarised as follows:—

(*a*) To relieve overcrowding, ...	1,000 houses.
(*b*) To replace houses at present occupied which should be closed and demolished (not to include houses entered under (*c*)), ...	1,500 ,,
(*c*) To re-house persons who will be dispossessed by Improvement and Reconstruction Schemes under Part II. of the Housing (Scotland) Act, 1925, ...	318 ,,
(*d*) To accommodate persons at present living in furnished apartments or otherwise who desire a house, . .	2,500 ,,
Total number of houses immediately required, . .	5,318

This measurement of the minimum housing requirements of the City of Aberdeen is based on facts, and while the survey of the housing requirements of the City has been intensive, it cannot be regarded as complete, and, accordingly, it may be accepted that the number of houses immediately required in Aberdeen is in some excess of the 5,318 houses above enumerated.

In terms of the Minutes of Council of 5th January, 1927, the Town Council have authorised the building of 1,000 dwellings at Hilton and Cattofield in 250 blocks of four three-room flatted dwelling-houses as the first instalment towards the total of 5,318 houses as above estimated by the Health Department as necessary to meet the immediate housing requirements of the City.

FACTORIES, WORKSHOPS, AND WORKPLACES.

Factories.—Table VIII. is submitted, giving details of the administration of the Factory and Workshop Act, 1901. No prosecutions had to be instituted under the Act, but a large number of defects discovered during the routine inspections were remedied.

Table VIII.—Aberdeen.—Factories, Workshops, and Workplaces, 1925.

1.—Inspection of Factories, Workshops, and Workplaces.

Including Inspections made by Sanitary Inspectors.

Premises.	Number of		
	Inspections.	Written Notices.	Prosecutions.
Factories (including Factory Laundries) . .	1,471	95	0
Workshops (including Workshop Laundries) .	2,339	288	0
Workplaces (other than Outworkers' premises) .	66	16	0
Total	3,876	399	0

2.—Defects Found in Factories, Workshops, and Workplaces.

Particulars.	Number of Defects			Number of Prosecutions.
	Found.	Remedied.	Referred to H.M. Inspector.	
Nuisances under the Public Health Acts.*				
Want of cleanliness	641	625	0	0
Want of ventilation	6	5	0	0
Overcrowding	1	1	0	0
Want of drainage of floors	2	2	0	0
Other nuisances	182	164	0	0
Sanitary accommodation — Insufficient	8	3	0	0
Sanitary accommodation — Unsuitable or defective	30	28	0	0
Sanitary accommodation — Not separate for sexes	0	0	0	0
Offences under the Factory and Workshop Acts.				
Illegal occupation of underground bakehouse (s. 101)	0	0	0	0
Other offences (Excluding offences relating to outwork and offences under the Sections mentioned in the Schedule to the Scottish Board of Health (Factories and Workshops Transfer of Powers) Order, 1921.)	1	1	0	0
Total	871	829	0	0

* Including those specified in Sections 2, 3, 7, and 8 of the Factory and Workshop Act, 1901, as remediable under the Public Health Acts.

Workshops.—The number of workshops, exclusive of bakehouses, registered at the end of 1925 was 744, as compared with 765 in 1924.

Excellent work continues to be done by the Sanitary Inspector and his staff in the sanitary control of the workshops of the City. Every workshop is inspected at least once a year, and an effort is made to keep it in accordance with the requirements of the Public Health Act and the Factory and Workshop Acts. Fish-curing and provision-curing works are inspected very frequently, some of them almost daily, the primary object of the visit being the inspection of the food. The bulk of the defects found during 1925 had reference to want of cleanliness.

In regard to Section 61 of the Factory and Workshop Act, 1901, whereby it is enacted that no woman or girl shall be employed within a factory or workshop within four weeks after she has given birth to a child, it has been ascertained through the Health Visitors that there is no evidence that women are so employed in Aberdeen.

Bakehouses.—The bakehouses, of which there were 82 in the City in 1925, as compared with 79 in 1924, were, as usual, inspected every quarter or oftener, and were found, on the whole, to be in a satisfactory condition. Certain sanitary defects in connection with bakehouses were remedied at the suggestion of the Health Department.

Home Workers.—With regard to home workers, the usual routine inspections were made in connection with the sanitary condition of the premises and the prevention of infectious diseases.

Inspection of Plans.—During the year under review, plans of 12 premises, chiefly alterations and additions to existing buildings, were examined and reported on by the Medical Officer of Health and Sanitary Inspector. Certain recommendations in regard to the lighting and ventilation of the premises were given effect to prior to the approval of the plans by the Town Council.

OFFENSIVE TRADES.

The offensive trades in Aberdeen, within the meaning of the Public Health Act, are concerned chiefly with tallow-melting or oil extracting from ox bones or fish livers, soap boiling, slaughtering, knackering, hide factoring, and the manufacture of manures and fish meal.

No new applications for the establishment of offensive trades were sanctioned during the year. Three applications for sanction to extend existing premises were received and granted.

All the premises in which offensive trades are carried on are kept under regular supervision by the Sanitary Inspector and his staff. In the 1924 Annual Report, reference was made to a nuisance of offensive effluvia emanating from a business of tallow-melting in premises situated in the centre of the City. The nuisance has been remedied by the transference of the business to premises outwith the City boundary. Complaints were received and dealt with regarding smells from fish-oil works and from a knackery.

DRAINAGE.

A survey has been made during the year of all tenemented properties in the City, and particulars obtained of the number of dwelling-houses in each property, the number of adults and children living therein, and the number and situation of the water-closets and sinks. This has been done with the view of enabling the Department, so soon as circumstances permit, to deal with all properties where the number of water-closets and sinks are inadequate. The matter is referred to at length in the 1925 Report of the Sanitary Inspector.

WATER SUPPLY.

The progress made during 1925 with the construction of the new works under the 1916 Corporation Water Act is recorded in the Report of the Water Engineer.

The instructive table on page 127, measuring in percentages the degree of purity of the water in terms of bacillus coli, provides evidence of the present state of the water as compared with the two previous years. The table shows that, during 1925, Aberdeen tap water was distinctly poorer in bacteriological quality than in the preceding two years. This was due to the continued interference with the water supply, which progress in the construction of the new works has necessitated.

Typical Bacillus Coli.

Year.	Samples from.	Absent in 100 c.c. per cent.	Present in 100 c.c. per cent.	Present in 50 c.c. per cent.	Present in 20 c.c. per cent.	Present in 10 c.c. per cent.	Present in 5 c.c. per cent.	Present in 1 c.c. & less per cent.	Remarks.
1925	River Water . . .	...	...	...	2	6	36	56	The water was limed for a total period of 5 days when the river was in a disturbed state after floods, during times of high consumpt of water when the filters were inadequate to deal with the quantity of water required, and when resanding of filters was being carried out.
	Invercannie Filter Outlet	45	22	31	2	...	...	...	
	Aberdeen Tap Water .	13	17	33	12	12	9	4	
1924	River Water . . .	...	...	...	...	...	55	45	The water was limed for a total period of 74 days when the river was in a disturbed state after floods, during times of high consumpt of water when the filters were inadequate to deal with the quantity of water required, and when resanding of filters was being carried out.
	Invercannie Filter Outlet	32	18	30	20	...	...	...	
	Aberdeen Tap Water .	18	12	35	35	...	...	...	
1923	River Water . . .	...	...	2	...	14	61	23	The water was limed for a total period of 115 days when the river was in a disturbed state after floods, during times of high consumpt of water when the filters were inadequate to deal with the quantity of water required, and when resanding of filters was being carried out.
	Invercannie Filter Outlet	57	20	21	2	..	...	...	
	Aberdeen Tap Water .	47	30	21	2	...	...	...	
Aberdeen Tap Water, 1907, . (*i.e.*, before the Water was filtered.)		...	...	13	...	29	33	25	

CHAPTER V.

SPECIAL HEALTH SERVICES.

CITY HOSPITAL SERVICES.

The admissions to the City Hospital during 1925 are shown in Table IX. The total admissions amounted to 1,882, as compared with an average of 1,592 during the 1915-1924 decennium.

The daily number of patients under treatment varied from 241 to 307, the average daily number being 255.

Small-pox.—One case of this disease, which recovered, was admitted to the City Hospital in January. The patient had contracted infection in Yorkshire. Details of the case appear in Chapter III. of this Report.

Chicken-pox.—Seven cases were admitted to hospital. As was to be expected, no deaths from this disease occurred.

Scarlet Fever.—The number of cases of scarlet fever admitted was 625, as compared with an annual average of 438 during the preceding decennium. There were 12 deaths, giving a case-mortality of 1·9 per cent., as against an average of 3·6 per cent. during the 1915-1924 decennium. An account of the work done in connection with Dick testing and streptococcus toxin immunisation against scarlet fever is given in Chapter I. of this Report.

Diphtheria.—Of this disease, 427 cases were admitted during the year, as compared with an annual average of 435 during the preceding decennium. The deaths numbered 21, the case-mortality being 4·9 per cent., as compared with an average of 5·4 for the 1915-1924 decennium. An account of the work done in connection with Schick testing and toxin-antitoxin immunisation against diphtheria is given in Chapter I. of this Report.

Measles.—Of this disease, 86 cases were admitted to hospital, with 9 deaths, the case-mortality being 10·5 per cent. During the 1915-1924 decennium, the average annual number of cases admitted was 77, with 9 deaths, and a case-mortality of 11·7 per cent.

German Measles.—Three cases were admitted during the year. As would be expected, there were no deaths.

Whooping Cough.—The admissions during the year numbered 48, with 18 deaths, giving a case-mortality of 37·5 per cent. During the 1915-1924 decennium, the average annual number of cases admitted was 20, with 4 deaths, and a case-mortality of 20·0 per cent.

Table IX.—ABERDEEN.—CITY HOSPITAL.—ANNUAL SUMMARY.

†Admissions and Deaths during each Year from 1915 to 1925 inclusive.

Disease.		1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1915-1924. Total	1915-1924. Annual Average
Small Pox,	Admitted, ...	1	1	1	0	0	0	0	8	0	0	0	10	1·0
	Died, ...	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0
Scarlet Fever, ...	Admitted, ...	625	186	238	272	538	375	247	204	245	812	1267	4384	438·4
	Died, ...	12	*4*	*4*	*6*	*6*	*7*	*4*	*2*	*8*	*22*	*94*	157	15·7
Diphtheria,	Admitted, ...	427	282	185	287	684	536	533	348	327	553	618	4353	435·3
	Died, ...	21	*11*	*8*	*14*	*35*	*28*	*29*	*19*	*18*	*32*	*40*	234	23·4
Typhus Fever, ...	Admitted, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
	Died, ...	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0
Typhoid and Para-Typhoid Fever,	Admitted, ...	42	10	23	9	6	7	22	104	1	10	13	205	20·5
	Died, ...	0	*1*	*3*	*0*	*0*	*2*	*5*	*14*	*1*	*2*	*1*	29	2·9
Acute Poliomyelitis,	Admitted, ...	5	3	0	7	4	3	1	1	9	69	0	97	9·7
	Died, ...	0	*0*	*0*	*0*	*2*	*0*	*1*	*1*	*0*	*2*	*0*	6	0·6
Cerebro-Spinal Meningitis	Admitted, ...	1	4	6	3	5	5	15	7	1	5	15	66	6·6
	Died, ...	0	*3*	*3*	*2*	*3*	*1*	*11*	*7*	*1*	*2*	*11*	44	4·4
Acute Pneumonias	Admitted, ...	118	69	24	52	24	44	2	...	...	...	...	...	...
	Died, ...	11	*9*	*3*	*14*	*10*	*9*	*1*	...	...	...	...	...	...
Erysipelas,	Admitted, ...	27	15	22	32	37	40	16	17	13	9	2	203	20·3
	Died, ...	2	*3*	*0*	*4*	*3*	*4*	*1*	*2*	*1*	*1*	*0*	19	1·9
Puerperal Fever, ...	Admitted, ...	20	11	8	4	7	9	4	4	2	3	1	53	5·3
	Died, ...	7	*3*	*3*	*1*	*2*	*3*	*1*	*2*	*1*	*0*	*0*	16	1·6
Measles, ...	Admitted, ...	86	96	49	209	1	52	24	112	166	7	58	774	77·4
	Died, ...	9	*11*	*11*	*39*	*0*	*6*	*0*	*4*	*11*	*0*	*8*	90	9·0
Whooping Cough	Admitted, ...	48	91	0	32	5	6	21	18	17	2	4	196	19·6
	Died, ...	18	*18*	*0*	*10*	*0*	*2*	*2*	*4*	*3*	*0*	*0*	39	3·9
Tuberculosis	Admitted, ...	220	260	275	313	320	287	353	375	391	317	275	3166	316·6
	Died, ...	52	*47*	*47*	*50*	*42*	*47*	*76*	*78*	*69*	*56*	*43*	555	55·5
‡Ailing Infant Wards	Admitted, ...	160	161	167	192	178	143	96	...	...	...	...	...	...
	Died, ...	51	*44*	*50*	*70*	*75*	*76*	*61*	...	...	...	...	...	...
Other Cases,	Admitted, ...	102	104	130	140	118	135	209	243	116	40	52	1287	128·7
	Died, ...	11	*17*	*12*	*13*	*13*	*12*	*30*	*71*	*32*	*12*	*3*	215	21·5
Total Cases,	Admitted, ...	1882	1293	1128	1552	1927	1642	1520	1441	1288	1827	2305	15923	1592·3
	Died, ...	194	*171*	*144*	*223*	*191*	*197*	*219*	*204*	*145*	*129*	*200*	1823	182·3
Average Daily Number of Patients in Hospital, ...		255	189	180	198	264	255	231	222	201	276	270	...	229

† Including cases admitted from outside City. ‡ From 1917 to 1919, admissions to Ailing Infant Wards included in "Other Cases."

Acute Pneumonias.—During the year, 118 cases of acute primary and acute influenzal pneumonia were admitted for treatment, as compared with an annual average of 43 during the preceding quinquennium. A total of 10 cases proved suitable for serum therapy, being infections with Type I. pneumococcus. During 1925, 11 deaths occurred, as against an annual average of 9 during the preceding five years.

Tuberculosis.—During the year, 220 cases were admitted to hospital, as against an average of 317 during the 1915-1924 decennium.

Of the 220 cases admitted, all were cases of respiratory tuberculosis except 49. These cases of extrapulmonary tuberculosis consisted of 21 cases of tuberculosis of bones and joints, 5 cases of tuberculous meningitis, 13 cases of abdominal tuberculosis, 9 cases of tuberculous glands, and 1 case of generalised tuberculosis. Of the 171 respiratory cases, 86 were males and 85 females, and of the other cases, 28 were males and 21 females.

The cases of respiratory tuberculosis discharged from the City Hospital during the year numbered 130. As to the condition on discharge, 66 per cent. had improved in general health, 67 per cent. showed an increase in weight, 21 per cent. showed an improvement in the lung condition, some 45 per cent. were considered by the Tuberculosis Officer as fit for work or school, and in 70 per cent. of the cases the pulmonary condition was stationary.

As to the presence of tubercle bacilli in the sputum of cases admitted, 30 per cent. were positive; and 41 per cent. of the patients had bacilli in the sputum on discharge.

Meningococcic Meningitis.—There was one admission, resulting in recovery, as compared with an annual average of 6 admissions and 4 deaths during the preceding ten years.

Acute Poliomyelitis.—Five cases were admitted during the year. There were no deaths.

Epidemic Encephalitis.—Seven cases were admitted. There were no deaths.

Typhoid and Paratyphoid Fever.—In 1925, 42 cases were admitted. There were no deaths. In the preceding decennium, the average annual number of cases admitted was 21 and the deaths, 3.

Erysipelas.—Of this disease, 27 cases were admitted to hospital, with 2 deaths; the average annual number of cases admitted during the 1915-1924 decennium being 20, with 2 deaths.

Puerperal Fever.—In 1925, 20 cases were admitted, with 7 deaths; the average for the preceding decennium being 5 cases and 2 deaths.

Venereal Diseases.—During the year, 10 cases of syphilis and 6 cases of gonorrhœa were admitted for treatment.

Marasmus Wards.—There were 160 admissions, with 51 deaths.

Cleansing Block and Skin Department.—Full details of the verminous conditions among school children are to be found in the annual reports of the Chief Medical Officer of the Education Authority.

Table X. shows that during the year the number of verminous persons, whether members of families with children of school age or not, disinfested at the City Hospital Cleansing Department, was 447. This table also shows that a total of 204 persons was treated for scabies in the skin wards of the Cleansing Department.

TABLE X.—ABERDEEN.—CLEANSING STATION.—YEAR 1925.

	Age Groups (years).				All Ages.
	0–5	5–15	15–25	25 +	
Verminous Persons Cleansed, .	62	153	84	148	447*
Scabies Cases Treated, . . .	27	67	42	68	204
Totals, ...	89	220	126	216	651

* Including 15 Army Cases.

TUBERCULOSIS SERVICES.

Mortality from Tuberculosis.—As compared with 1924, the deaths from respiratory tuberculosis during 1925 showed an increase, there being 154 deaths, as against 143, while on the other hand, the deaths from other forms of tuberculosis in 1925 showed a definite decrease, there being 43 deaths, as against 70 in 1924.

Table XI., on page 132, as also the accompanying chart, shows the great fall in the tuberculosis death-rate during the past sixty odd years. The rapidity of the decline of the death-rate from respiratory tuberculosis, as represented by the slope of this line, in the accompanying diagram, shows that it has considerably slackened within the past fifteen years.

Table XII. gives the number of tuberculosis cases notified during the year, divided into respiratory and non-respiratory cases, and arranged according to sex and age-period. It will be observed that while respiratory cases were most numerous at the age-periods 5-45 years, and the non-respiratory at ages under 15 years, all forms of tuberculosis taken together and estimated per year of age-period, show, on the whole, a well-marked declension in prevalence as age advances. It will also be observed that the number of deaths per age-period during the year under review is highest in the 0-5 age-period.

As regards the percentage of deaths to notified cases, the percentage was lowest in the 5-15 period, being 12 per cent., and highest at the period of 65 years and upwards, being 83 per cent.

TABLE XI.—ABERDEEN.—MORTALITY FROM TUBERCULOSIS IN YEARS 1856-1925,*

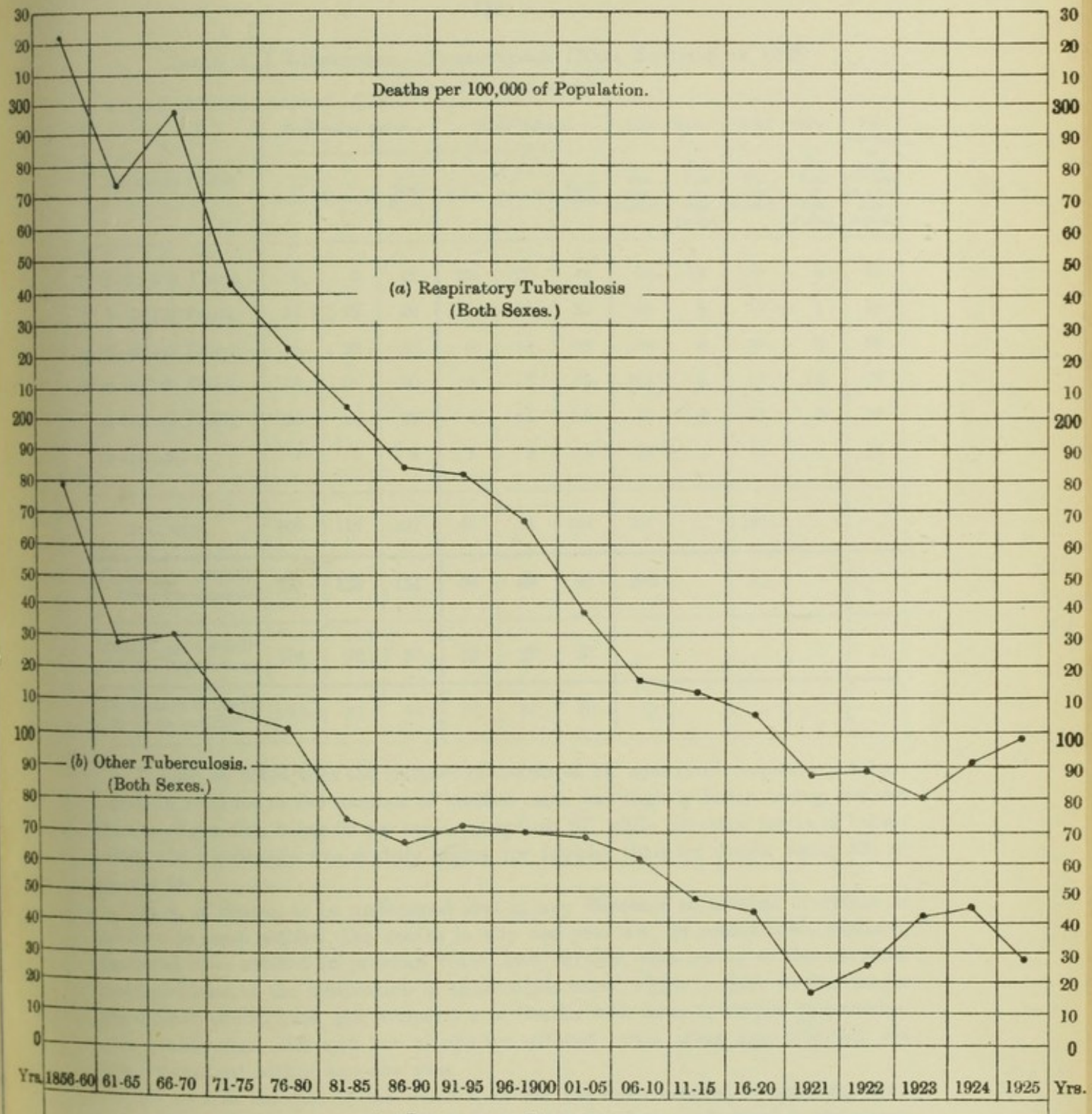
Per 100,000 of Population.

PERIOD.	RESPIRATORY TUBERCULOSIS.			OTHER TUBERCULOUS DISEASES.			ALL TUBERCULOUS DISEASES.		
	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.
1856-60 .	333	312	322	235	135	179	568	447	501
1861-65 .	267	279	274	158	103	128	425	382	402
1866-70 .	295	300	298	170	98	130	465	398	428
1871-75 .	234	250	243	129	89	107	363	339	350
1876-80 .	217	228	223	112	92	101	329	320	324
1881-85 .	189	216	204	90	62	74	279	278	278
1886-90 .	179	188	184	76	60	67	255	248	251
1891-95 .	179	183	181	83	62	72	262	245	253
1896-1900 .	166	168	167	77	64	70	243	232	237
1901-05 .	143	134	138	79	62	69	222	196	207
1906-10 .	119	113	116	74	51	61	193	164	178
1911-15 .	125	99	111	53	47	49	177	146	160
1916-20 .	104	107	106	49	39	43	153	146	149
1916 . .	110	120	116	39	29	34	149	150	149
1917 . .	132	102	116	67	49	57	199	151	173
1918 . .	107	114	111	57	47	51	164	161	162
1919 . .	95	82	88	50	37	43	145	119	131
1920 . .	77	116	98	31	32	32	109	148	130
1921 . .	81	95	88	18	16	17	98	111	105
1922 . .	103	77	89	31	21	26	135	98	115
1923 . .	107	58	80	53	33	43	160	91	123
1924 . .	100	83	91	55	35	44	155	118	135
1925 . .	104	92	97	26	28	27	130	120	124

*Corrected for transferred deaths in 1904 and subsequent years.

Aberdeen—Tuberculosis, 1856-1925.—Quinquennial Periods.

All Ages. Both Sexes.



	1856-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-1900	01-05	06-10	11-15	16-20	1921	1922	1923	1924	1925
(a) Respiratory Tuberculosis.	322	274	298	243	223	204	184	181	167	138	116	111	106	88	89	80	91	97
(b) Other Tuberculosis.	179	128	130	107	101	74	67	72	70	69	61	49	43	17	26	43	44	27

Deaths per 100,000 of Population.

(Corrected for transferred deaths in 1904 and subsequent years.

TABLE XII.—ABERDEEN.—TUBERCULOSIS CASES NOTIFIED IN 1925.

(*Corrected for Transfers.*)

AGE-PERIOD (Years).	Respiratory Tuberc.			Other Tuberc.			Total Cases.		Total Deaths.		Percentage of Deaths to Cases at each Age-Period.
	Males.	Females	Both Sexes.	Males	Females	Both Sexes.	For Age-Period.	Per Year of Age-Period.	For Age-Period.	Per Year of Age-Period.	
Under 5 (*5 Years*), .	6	6	12	22	26	48	60	12	23	5	38
5—15 (*10 Years*), .	17	23	40	31	22	53	93	9	11	1	12
15—25 (*10 Years*), .	18	20	38	6	14	20	58	6	38	4	66
25—45 (*20 Years*), .	39	51	90	6	7	13	103	5	78	4	76
45—65 (*20 Years*), .	25	14	39	2	4	6	45	2	37	2	82
65 and above, . .	4	4	8	1	3	4	12	...	10	...	83
ALL AGES, .	109	118	227	68	76	144	371	...	197	...	...
Cases per 100,000 of Sex Population	151	138	144	94	89	91	235	...	...	...	..
Deaths per 100,000 of Sex Population	104	92	97	26	28	27	...	...	...	...	...
Percentage of Deaths to Cases notified .	69	67	68	28	32	30	53	...	...	...	...

It may be noted that the number of deaths at all ages from respiratory tuberculosis in relation to the number of notified cases was slightly lower among females than among males, being 69 per cent., as against 67, while for other forms of tuberculosis the percentage was slightly higher for females than for males, being 32, as against 28.

It is, of course, to be understood that in any reference to number of deaths in relation to cases notified, the deaths in any one year are, in considerable measure, deaths of cases notified in previous years, and, further, that owing to the admitted incompleteness of the notification of tuberculous cases, which in their earlier stages are difficult to diagnose, the comparison of deaths with cases is subject to considerable qualification, although not altogether without value, when ages and sex are being compared within any one year.

As regards the *Site of the Disease*, in the 144 cases notified as suffering from tuberculosis other than respiratory, 29 were suffering from abdominal tuberculosis, 22 from tuberculous meningitis, 20 from tubercle of bones and joints (including the spine), 64 from tuberculous glands (mainly cervical), and 9 from generalised and other tuberculosis (including 5 of lupus).

There were 14 deaths of abdominal cases, 19 of meningical cases, 2 of cases of bones and joints, and 8 of other cases.

Occupations.—The following is a summary of the occupations of the cases notified during the year under review. The numbers given have, of course, no value as an indication of the relative prevalence of the disease without information as to the number of persons engaged in each occupation. Moreover, even if these numbers were supplied—and they are obtainable from the census—they are in most instances too small to yield reliable statistical conclusions for a single year, but it may be said, speaking generally, that during 1925 labourers showed, among the males, the highest incidence.

ABERDEEN.—OCCUPATION OF PERSONS NOTIFIED AS SUFFERING FROM TUBERCULOSIS.

(a) Males.

	1925.	
	Respiratory.	Other.
Children under school age,	8	25
Children at school,	17	27
Engineer, &c.,	11	3
Labourer,	15	2
Millworker (including Combmaker),	6	—
Stonecutter or Mason,	6	2
Stonepolisher,	—	—
Clerk,	3	2
Joiner,	2	—
Carter,	2	1
Tailor,	1	—
Painter,	1	—
Printer or Lithographer,	1	1
Other or no occupation,	33	5
No information,	3	—
Totals,	109	68

(b) Females.

	1925.	
	Respiratory.	Other.
Children under school age,	6	27
Children at school,	23	21
Wife or Widow,	49	7
Mill or Factory Worker,	7	3
Domestic Servant or Charwoman,	10	1
Dressmaker or Milliner,	1	3
Clerk or Typist,	5	1
Shop Assistant,	4	2
Fishworker,	3	—
Nurse,	2	2
Teacher or Student,	1	1
Laundry Worker,	1	1
Other, at home, or no occupation,	4	5
No information,	2	2
Totals,	118	76

Insured Persons (National Insurance Act).—Of the 227 cases of respiratory tuberculosis notified, 94 were insured persons, 63 being male and 31 being female. The notified cases of other forms of tuberculosis included 26 insured persons, 13 of whom were males and 13 females.

As stated in previous Reports, the Town Council have now assumed full financial responsibility for the treatment of insured tuberculous patients. The accounts for medical prescriptions and the prescriptions themselves are forwarded to the National Health Insurance Central Checking Bureau in Glasgow to be audited, and are thereafter submitted for payment to the Town Council. During the year, the number of such prescriptions passed for payment amounted to 1,735.

Food Supply.—During 1925, food, chiefly milk, was supplied to an average daily total of 42 patients.

Supervision of Cases.—The Tuberculosis Medical Officer had the assistance of three Tuberculosis Health Visitors or Nurses in the visitation and supervision of tuberculosis cases throughout the year.

Size of House and Density of Occupancy.—Table XIII., on page 136, gives the number of cases occurring in houses of different sizes, along with the average number of inmates. In the case of respiratory tuberculosis, the average number of inmates, including the patient, varied from 3·0 in one-roomed houses to 6·3 in houses of five rooms and upwards. The average for houses of all sizes taken together was 4·7.

In the cases of other forms of tuberculosis, the average ran from 4·4 for one-roomed houses to 6·0 for three-roomed houses. The average for all houses was 4·2.

As regards the position of tuberculous cases in relation to room and bed accommodation at the time of notification, it was found that of the 227 cases of respiratory tuberculosis, only 64, or 28 per cent., were occupying a separate bed in a separate room, and 28, or 12 per cent., had a separate bed but not a separate room. More than one-half had neither a separate bed nor a separate room.

Assistance in Payment of Rent.—In December, 1916, the Town Council voted £100 out of the Common Good for the purpose of assisting necessitous tuberculous patients to secure improved housing accommodation while suffering from tuberculosis. During 1925 one tuberculous patient received such assistance.

Loan of Beds.—In order to facilitate the separation of the patient from the other members of the household, 42 beds or cots, with the necessary bedding, were given on loan to needful patients. On the last day of the year, there were on loan 128 beds with bedding, as against 153 at the end of 1924. In addition, at the end of 1925, there were 7 sets of bedding on loan, as against 18 at the end of 1924. The loaned beds and bedding continue to be well cared for, and are nearly always returned in good and clean condition, subject to the unavoidable effects of ordinary use.

Institutional Treatment.—The table on page 138 contains information as to the number of cases that were admitted to indoor institutional treatment during 1925, or were in clinical institutions when notified. The number of cases for each institution is given, and a distinction is made between respiratory cases and cases of other forms of tuberculosis.

TABLE XIII.—ABERDEEN.—TUBERCULOSIS.—SIZE OF HOUSE IN RELATION TO NOTIFIED CASES AND REGISTERED DEATHS DURING 1925.

		1 Room.	2 Rooms.	3 Rooms.	4 Rooms.	5 Rooms and up.	Institutional or not stated.	Totals for 1925.	Corresponding Totals for 1924.	Corresponding Totals for 1923.
Respiratory Tuberculosis (Cases),	Male,	13	50	31	7	3	5	109	154	140
	Female,	13	52	29	12	5	7	118	131	124
Both Sexes,	Cases,	26	102	60	19	8	12	227	285	264
	Deaths,	15	56	37	16	19	11	154	143	128
Average Number of Inmates, including Patient,		3·0	4·7	5·2	5·2	6·3	...	4·7	5·1	5·0
Other Tuberculosis (Cases)	Male,	3	28	25	8	2	2	68	66	64
	Female,	6	36	20	3	4	7	76	68	70
Both Sexes,	Cases,	9	64	45	11	6	9	144	134	134
	Deaths,	3	18	17	2	3	...	43	70	68
Average Number of Inmates, including Patient,		4·4	5·1	6·0	5·5	5·0	...	5·3	5·5	5·5
All Houses in City at Census, 1921 Average Number of Inmates,		2·2	3·9	4·7	4·7	4·8	...	4·2	...	...

During the year, a total of 315 cases of all forms of tuberculosis were admitted to indoor institutional treatment, after deducting 19 cases that had received treatment in two institutions.

Of 223 respiratory cases treated, 42 were under ten years of age, 47 between ten and twenty years, 91 between twenty and forty years, and 43 above forty. Of other tuberculous cases, the numbers for the corresponding age-periods were respectively 57, 18, 10, and 7.

The average stay of the tuberculosis cases discharged during the year from the hospitals and sanatoria giving indoor institutional treatment was, in respect of respiratory cases, 187 days for the City Hospital, 52 days for the Royal Infirmary, 92 days for the Sick Children's Hospital, and 175 days for Newhills Sanatorium. As regards the cases of other forms of tuberculosis, the average stay was 177 days for the City Hospital, 20 for the Royal Infirmary, and 28 for the Sick Children's Hospital.

As to outdoor institutional treatment, 447 cases, all of which were of respiratory tuberculosis except 41, received treatment in the Tuberculosis Institute at the City Hospital.

TABLE XIV.—ABERDEEN—TUBERCULOSIS CASES—ROOM AND BED ACCOMMODATION AT NOTIFICATION.

YEAR.	RESPIRATORY TUBERCULOSIS.															OTHER TUBERCULOSIS.													
	MALES.					FEMALES.					BOTH SEXES.					MALES.					FEMALES.					BOTH SEXES.				
	Separate Bed.		No separate Room or Bed.	Not stated.	Totals.	Separate Bed.		No separate Room or Bed.	Not stated.	Totals.	Separate Bed.		No separate Room or Bed.	Not stated.	Totals.	Separate Bed.		No separate Room or Bed.	Not stated	Totals.	Separate Bed.		No separate Room or Bed.	Not stated.	Totals.	Separate Bed.		No separate Room or Bed.	Not stated.	Totals.
	and separate Room.	but not separate Room.				and separate Room.	but not separate Room.				and separate Room.	but not separate Room.				and separate Room.	but not separate Room.				and separate Room.	but not separate Room.				and separate Room.	but not separate Room.			
1925	37	18	50	4	109	27	10	74	7	118	64	28	124	11	227	8	13	46	1	68	16	17	39	4	76	24	30	85	5	144
1924	40	17	84	13	154	35	14	77	5	131	75	31	161	18	285	7	22	35	2	66	10	14	42	2	68	17	36	77	4	134
1923	38	19	81	2	140	37	15	68	4	124	75	34	149	6	264	9	17	37	1	64	12	15	41	2	70	21	32	78	3	134
1922	43	26	101	14	184	24	13	115	17	169	67	39	216	31	353	4	14	24	7	49	6	12	34	4	56	10	26	58	11	105
1921	57	22	102	9	190	42	24	116	10	192	99	46	218	19	382	7	10	23	3	43	6	19	22	6	53	13	29	45	9	96
1920	59	23	98	12	192	58	19	109	11	197	117	42	207	23	389	11	14	33	8	66	9	23	41	6	79	20	37	74	14	145
Aver. 1920-1924	48	21	93	10	172	39	17	97	9	162	87	38	190	19	334	8	15	30	4	57	8	17	36	4	65	16	32	66	8	122

TUBERCULOSIS CASES NOTIFIED AND RECEIVING INDOOR INSTITUTIONAL TREATMENT.

	1925.		
	Resp. Tuberc.	Other Tuberc.	Total.
City Hospital (Sanator. Wards and Shelters),	150	49	199
Newhills Sanatorium,	23	2	25
Parish Council Hospital,	3	4	7
Royal Infirmary,	8	5	13
Royal Hospital for Sick Children,	2	26	28
Linnmoor Home (for Children),	38	9	47
Scotston Moor Camp do.	0	1	1
Kingseat Mental Hospital,	3	0	3
Institutions not connected with City:—			
A. In Scotland,	6	3	9
B. In England,	2	0	2
Total admissions,	235	99	334
Deduct cases treated in two institutions,	12	7	19
	223	92	315

VENEREAL DISEASES SERVICES.

ATTENDANCES FOR TREATMENT.

During the year, a total of 434 new City cases attended for treatment at the Royal Infirmary, as compared with 474 in 1924. In all, 42 City cases were admitted for in-patient treatment in 1925, as compared with 28 in 1924. The total number of attendances of all City cases during the year was 25,919, as compared with a total of 23,861 in 1924.

OPHTHALMIA NEONATORUM.

Ophthalmia Neonatorum has already been referred to in Chapter III. of this Report.

As has already been stated, a total of 59 cases was reported during 1925, as compared with an annual average of 65 during the preceding ten years.

VENEREAL DISEASE STATISTICS.

The statistical data (see pp. 139-141) of the incidence and treatment of venereal diseases, as measured under the Joint Scheme, are submitted for the year under review. The statistical data relating to work done in connection with venereal diseases at the City Hospital Sub-Centre are also submitted.

BLIND PERSONS SERVICES.

During the year 1925, there were 7 persons who applied for and received from the Town Council assistance towards their maintenance during the period of technical training. At the end of December, 1925, 16 persons in all were receiving such assistance.

CHIEF TREATMENT CENTRE AT ABERDEEN ROYAL INFIRMARY.

Total Number of New Cases.

Year.	Whole Joint Scheme.											Aberdeen City Cases only.										
	Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.		Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**632**	**85**	**61**	**299**	**52**	**3**	**0**	**5**	**2**	**83**	**42**	**434**	**44**	**35**	**237**	**38**	**3**	**0**	**1**	**2**	**48**	**26**
1924	637	101	81	249	46	4	0	22	8	86	40	474	68	62	192	36	1	0	15	3	60	37
1923	626	109	100	235	41	6	0	24	9	58	44	460	64	83	183	29	2	0	13	5	48	33
1922	677	139	91	240	49	4	0	21	13	77	43	469	85	69	174	30	1	0	15	6	56	33
*1921	711	256	151	263	41							539	173	107	221	38						
*1920	762	325	137	263	37							580	228	99	221	32						
*1919	648	280	92	240	36							512	204	71	205	32						
*1918	387	149	104	110	24							316	112	90	96	18						

In-Patient Cases.

Year.	Whole Joint Scheme.											Aberdeen City Cases only.										
	Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.		Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**84**	**17**	**13**	**29**	**15**	**0**	**0**	**2**	**7**	**1**	**0**	**42**	**6**	**4**	**17**	**10**	**0**	**0**	**0**	**5**	**0**	**0**
1924	69	14	8	21	12	0	0	5	9	0	0	28	7	3	9	4	0	0	4	1	0	0
1923	63	16	6	13	12	2	0	5	7	0	2	22	5	3	6	4	1	0	1	1	0	1
1922	54	10	9	13	10	0	0	1	9	0	2	16	2	4	6	2	0	0	0	1	0	1
1921	72	12	29	9	11	1	0	2	8	0	0	32	6	17	4	3	0	0	1	1	0	0
1920	56	15	15	17	4	0	0	2	3	0	0	18	4	5	6	1	0	0	2	0	0	0
1919	66	27	18	12	4	0	0	2	3	0	0	23	6	8	5	2	0	0	1	1	0	0
1918	45	11	10	7	6	0	0	4	7	0	0	22	3	6	1	4	0	0	2	6	0	0

Attendances of all Cases.

Year.	Whole Joint Scheme.											†Aberdeen City Cases only.										
	Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.		Total.	Syphilis.		Gonorrhoea.		Soft Ch.		Mixed Infs.		Not V.D.	
		M.	F.	M.	F	M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**29,744**	**3,432**	**3,773**	**14,867**	**4,171**	**16**	**0**	**2,072**	**1,167**	**140**	**106**	**25,919**	**2,709**	**3,112**	**13,135**	**3,962**	**16**	**0**	**1,815**	**1,000**	**83**	**87**
1924	26,843	3,628	3,829	13,400	3,448	32	1	1,396	881	112	116	23,861	2,875	3,344	12,241	3,242	6	1	1,233	755	85	79
1923	24,157	3,959	3,892	10,485	3,607	18	8	858	1,128	117	85	21,286	3,191	3,346	9,706	3,225	10	1	709	965	75	58
1922	23,415	4,485	3,366	10,878	2,586	14	0	998	892	126	70	20,550	3,670	2,832	10,054	2,176	9	0	930	727	96	56
*1921	18,413	3,697	2,211	10,548	1,957																	
*1920	14,231	2,764	1,461	8,753	1,253																	
*1919	10,658	2,184	1,224	6,355	895																	
*1918	5,784	1,337	1,229	2,514	704																	

* Until 1922 all V.D. cases were classified under either "Syphilis" or "Gonorrhoea."

† Until 1922 no separate record was kept of the attendances of City Cases.

Laboratory Examinations.

(a) Total Number.

Year.	Whole Joint Scheme.							*Aberdeen City Cases only						
	Total.	Syphilis.				Gonorrhoea.		Total.	Syphilis.				Gonorrhoea.	
		Wassermann.		Spirochete.		Gonococcus.			Wassermann.		Spirochete.		Gonococcus.	
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.		Pos.	Neg.	Pos.	Neg.	Pos.	Neg
1925	**7,811**	**1,470**	**3,564**	**9**	**114**	**465**	**2,189**	**6,366**	**1,125**	**2,900**	**6**	**105**	**396**	**1,834**
1924	7,426	1,408	3,383	13	91	415	2,116	5,971	1,069	2,770	11	82	341	1,698
1923	7,164	1,459	3,163	41	117	514	1,870	5,635	1,115	2,518	27	105	407	1,463
1922	6,336	1,128	3,211	54	129	415	1,399	4,869	862	2,544	34	115	312	1,002
1921	4,462	677	2,401	88	145	384	767							
1920	3,441	795	1,716	74	122	299	435							
1919	2,337	669	1,072	54	86	276	180							
1918	1,322	435	578	38	47	111	113							

(b) Included in the foregoing Table (a) are the following number of specimens sent by private practitioners.

Year.	Whole Joint Scheme.							*Aberdeen City Cases only.						
	Total.	Syphilis.				Gon rrhoea.		Total.	Syphilis.				Gonorrhoea.	
		Wassermann.		Spirochete.		Gonococcus.			Wassermann.		Spirochete.		Gonococcus.	
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
1925	**631**	**121**	**283**	**1**	**9**	**50**	**167**	**413**	**60**	**146**	**1**	**9**	**45**	**152**
1924	702	155	261	3	6	58	219	478	82	152	3	6	48	187
1923	749	119	321	1	15	80	213	519	62	196	1	15	69	176
1922	873	124	433	2	8	72	234	550	72	239	2	8	56	173
1921	741	114	387	10	16	49	165							
1920	768	187	407	7	17	48	102							
1919	463	146	227	7	10	27	46							
1918	251	73	105	4	11	21	37							

(c) Included in Table (a) are also the undernoted numbers of bodies of infants, mostly still-born (all from City) examined for Syphilis.

Year.	Number of Bodies Examined.	Number found to contain the Spirochete of Syphilis
1925	**69**	**3**
1924	65	3
1923	65	7
1922	65	5
1921	56	14
1920	57	12
1919	43	7
1918	34	7

* Until 1922, no separate record was kept of Laboratory exam'nations for City cases.

SUB-CENTRE AT ABERDEEN CITY FEVER HOSPITAL FOR TREATMENT OF CERTAIN CITY CASES.

Total Number of New Cases.

Year.	Total.	Syphilis.		Gonorrhœa.		Soft Ch.		Mixed Infs		Not V.D.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**106**	**12**	**20**	**38**	**28**	**0**	**0**	**1**	**1**	**4**	**2**
1924	56	6	11	16	18	0	0	1	2	0	2
1923	8	3	4	1	0	0	0	0	0	0	0
1922	22	15	5	0	2	0	0	0	0	0	0
*1921	33	15	14	1	3						
*1920	157	67	45	26	19						
*1919	109	33	46	28	2						
*1918	129	53	51	23	2						

In-Patient Cases.

Year.	Total.	Syphilis.		Gonorrhœa.		Soft Ch.		Mixed Infs.		Not V.D.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**19**	**5**	**5**	**3**	**3**	**0**	**0**	**1**	**0**	**1**	**1**
1924	14	2	3	4	5	0	0	0	0	0	0
1923	5	2	2	1	0	0	0	0	0	0	0
1922	10	4	4	0	2	0	0	0	0	0	0
1921	13	4	3	1	5	0	0	0	0	0	0
1920	38	12	4	1	19	0	0	0	2	0	0
1919	21	5	10	0	5	0	0	0	1	0	0
1918	8	4	4	0	0	0	0	0	0	0	0

Attendances.

Year	Total.	Syphilis.		Gonorrhœa.		Soft Ch.		Mixed Infs.		Not V.D.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1925	**4,189**	**98**	**207**	**1,803**	**2,053**	**0**	**0**	**17**	**4**	**5**	**2**
1924	1,144	59	81	362	556	0	0	1	82	0	3
1923	131	98	27	3	3	0	0	0	0	0	0
1922	248	196	50	0	2	0	0	0	0	0	0
*1921	445	203	151	58	33						
*1920	1,007	382	254	351	20						
*1919	884	306	215	358	5						
*1918	1,049	366	388	290	5						

Laboratory Examinations.

Year.	Total.	Syphilis.				Gonorrhœa.	
		Wassermann.		Spirochete.		Gonococcus.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
1925	**1,561**	**92**	**340**	**1**	**2**	**140**	**986**
1924	733	79	256	0	2	70	326
1923	194	52	117	2	2	8	13
1922	184	40	129	0	3	3	9
1921	280	63	178	2	3	20	14
1920	541	133	273	8	16	72	39
1919	311	77	200	0	4	30	0
1918	348	98	212	0	1	30	7

* Until 1922, all V.D. cases were classified under either "Syphilis" or "Gonorrhœa."

MATERNITY AND CHILD WELFARE SERVICES.

Infantile Mortality.

During the year 1925, there were 368 deaths among children under one year of age, as compared with an average of 478 during the 1920-1924 quinquennium. The infant-mortality rate, expressed as deaths per 1,000 births, was 109 during 1925, as against an average of 118 during the preceding quinquennium. In 1924, the rate was 122, the increase being due to the prevalence of whooping-cough and measles.

The chief cause of mortality among infants in 1925, as appearing in Table XV., was, as usual, prematurity, with 81 deaths, as against an average of 97 for the preceding quinquennium. About three-fourths of the deaths from this cause took place within the first week of birth.

The second chief cause of death was respiratory diseases, which accounted for 60 deaths, as against an average of 94 in the 1920-1924 quinquennium.

The third chief cause of death was atrophy, debility and marasmus, with 52 deaths, more than half of these occurring during the first three months of life. There was an average of 97 deaths from these diseases during the preceding five years.

Diseases of the digestive system, including diarrhœa, come next, with 42 deaths, as against an average of 41 for the 1920-1924 quinquennium.

Convulsions come next, with 33 deaths, as against an average of 23 for the preceding quinquennium.

Next among the causes of death are the specific infectious diseases, of which whooping-cough, measles and tuberculosis are the chief.

Table XVI. shows the death-rates among children under one year of age, in terms of (*a*) legitimate deaths per 1,000 legitimate births, (*b*) illegitimate deaths per 1,000 illegitimate births, and (*c*) total deaths per 1,000 births.

In Table XVII. the causes of death are somewhat differently grouped from those in Table XV., and death-rates are substituted for numbers of deaths.

In Table XVII. also, two interesting columns show the number of infants surviving at the end of one year from birth, and the proportion which the survivors bear to the population. This rate, which represents the net gain to the population, after the perils peculiar to the first year of life have been passed, was, in 1925, 19·1 per 1,000 of population, as compared with an average of 19·8 for the ten years 1915-1924. This rate is a more exact indication than the birth-rate of the real internal addition to the population.

Births.

The figures of the births registered in Aberdeen during 1925 are analysed in detail in Chapter VI. of this Report.

The number of births registered in Aberdeen during the year was 3,535 (3,206 legitimate and 329 illegitimate).

TABLE XV.—ABERDEEN.—CAUSES OF DEATH AMONG CHILDREN UNDER FIVE YEARS OF AGE.—*Year* 1925.

CAUSES OF DEATH.	AGE.																Average for Preceding 5 Years. (1920-24.)	
	First Year.											Total	Second to Fifth Years.				Total	
	First Four Weeks.				First Three Months.			The Four Quarters.										
	0–1	–2	–3	–4	0–1	–2	–3	0–3	–6	–9	–12	0–1	–2	–3	–4	–5	1–5	0–1	1–5
Chicken-pox	...	...	...	...	...	...	...	...	2	5	5	12	9	2	...	...	11	18	36
Measles	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	2	8	0·2	2
Scarlet Fever	...	...	...	...	...	2	3	5	3	4	7	19	25	7	...	2	34	20	21
Whooping Cough	...	..	...	...	...	1	...	1	...	1	1	3	3	3	4	2	12	2	10
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	0·2
Erysipelas	...	...	1	2	3	...	1	4	1	...	...	5	...	...	...	...	...	2	0·2
Epidemic Cerebro-Spinal Meningitis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	1	1
Tuberculosis of (*a*) Brain	...	...	...	...	...	...	...	...	3	2	1	6	4	3	1	...	8	3	12
Tuberculosis of (*b*) Abdomen	...	...	...	...	...	...	...	...	...	...	...	...	1	3	...	...	4	2	5
Tuberculosis of (*c*) Lungs	...	...	...	...	...	..	...	...	...	1	...	1	...	...	...	...	...	2	3
Tuberculosis of (*d*) Other forms	...	...	...	...	...	...	...	...	...	2	1	3	...	1	...	...	1	1	4
Meningitis	...	...	...	...	...	...	...	...	...	...	2	2	...	...	1	...	1	5	3
Hydrocephalus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Convulsions	2	1	3	...	7	3	4	14	10	6	3	33	3	3	...	...	6	23	5
Pneumonia	1	...	...	1	2	6	3	11	12	9	6	38	15	2	2	...	19	57	29
Bronchitis	...	1	2	...	3	1	5	9	6	4	3	22	3	1	...	...	4	37	5
Diarrhoea and Enteritis	...	...	...	1	1	3	1	5	10	9	4	28	7	3	...	1	11	25	3
Other Digestive Diseases	...	...	...	...	2	2	1	5	6	2	1	14	3	1	...	1	5	16	4
Congenital Malformations	3	...	1	...	5	4	...	9	...	...	...	9	...	...	1	...	1	9	2
Congenital Heart	1	3	...	1	5	1	...	6	...	...	..	6	...	...	...	1	1	4	0·2
Prematurity	57	10	6	1	75	5	1	81	...	...	...	81	...	...	...	...	...	97	..
Atrophy, Debility, and Marasmus	2	2	3	3	13	5	13	31	17	2	2	52	...	...	...	...	...	97	2
Atelectasis	9	1	1	...	11	...	...	11	...	...	...	11	...	...	...	...	...	15	...
Injury at Birth	6	..	...	...	6	...	...	6	...	...	...	6	...	...	...	...	...	3	...
Syphilis	...	...	1	1	2	1	1	4	...	...	...	4	...	...	...	...	...	12	0·4
Burns and Scalds	...	...	...	..	...	...	...	...	...	...	1	1	4	2	...	...	6	0·6	12
Suffocation	...	..	1	...	1	...	...	1	...	...	...	1	...	...	...	...	...	3	...
Other Accidents	..	...	...	...	...	...	...	..	...	...	...	...	...	4	...	2	6	...	4
Other Causes	5	...	1	1	7	...	...	7	2	1	1	11	2	...	2	1	5	23	10
ALL CAUSES	86	18	20	11	143	34	33	210	72	48	38	368	82	36	13	12	143	478	174
Average for preceding 5 years	103	26	20	19	173	52	40	265	110	55	48	478	100	41	18	15	174		

TABLE XVI.—ABERDEEN.—DEATH RATES AMONG CHILDREN UNDER ONE YEAR OF AGE. *Year* 1925.

(a) Legitimate Deaths per 1,000 Legitimate Births; (b) Illegitimate Deaths per 1,000 Illegitimate Births; (c) Total Deaths per 1,000 Births.

Causes of Death.	First Four Weeks.												First Three Months.									The Four Quarters.												Total.		
	0—1			—2			—3			—4			*0—1			—2			—3			*I.			II.			III.			IV.					
	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.	Legit.	Illegit.	Both.
Chicken-pox,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Measles,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·6	..	0·6	1·6	..	1·5	1·6	..	1·5	3·8	..	3·6
Scarlet Fever,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Whooping Cough,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·6	..	0·6	0·6	4·0	0·9	1·2	4·0	1·5	0·9	..	0·9	1·3	..	1·2	1·9	4·0	2·1	5·4	8·0	5·7
Diphtheria,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·3	..	0·3	..	..	..	0·3	..	0·3	..	..	..	0·3	..	0·3	0·3	..	0·3	0·9	..	0·9
Erysipelas,	..	..	..	..	..	..	0·3	..	0·3	0·6	..	0·6	1·0	..	0·9	..	..	..	0·3	..	0·3	1·3	..	1·2	0·3	..	0·3	..	..	..	..	..	..	1·6	..	1·5
Ep. Cerebro-Sp. Meningitis,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tuberculosis of (a) Brain,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1·0	..	0·9	0·6	..	0·6	0·3	..	0·3	1·9	..	1·
Tuberculosis of (b) Abdomen,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tuberculosis of (c) Lungs,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·3	..	0·3	..	..	..	0·3	..	0·3
Tuberculosis of (d) Other Forms	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·6	..	0·6	0·3	..	0·3	0·9	..	0·9
Meningitis,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·6	..	0·6	0·6	..	0·6
Hydrocephalus,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Convulsions,	0·3	4·0	0·6	0·3	..	0·3	1·0	..	0·9	..	..	..	1·9	4·0	2·1	1·0	..	0·9	1·3	..	1·2	4·2	4·0	4·2	3·2	..	2·9	1·6	4·0	1·8	1·0	..	0·9	10·0	8·0	9·8
Pneumonia,	..	4·0	0·3	..	..	..	..	..	..	0·3	..	0·3	0·3	4·0	0·6	1·6	4·0	1·7	1·0	..	0·9	2·9	7·9	3·2	3·5	4·0	3·5	2·2	7·9	2·7	1·9	..	1·8	10·5	19·8	11·2
Bronchitis,	..	..	..	0·3	..	0·3	0·6	..	0·6	..	..	..	1·0	..	0·9	0·3	..	0·3	1·6	..	1·5	2·9	..	2·7	1·9	..	1·8	0·6	7·9	1·2	0·6	4·0	0·9	6·1	11·9	6·6
Diarrhœa and Enteritis,	..	..	..	..	..	..	..	..	..	0·3	..	0·3	0·3	..	0·3	1·0	..	0·9	0·3	..	0·3	1·6	..	1·5	2·6	7·9	2·9	2·6	4·0	2·7	1·3	..	1·2	8·1	11·9	8·3
Other Digestive Diseases,	..	..	..	..	..	..	..	..	..	..	..	..	0·6	..	0·6	0·3	4·0	0·6	0·3	..	0·3	1·2	4·0	1·5	1·6	4·0	1·8	0·6	..	0·6	0·3	..	0·3	3·8	8·0	4·2
Congenital Malformations,	0·9	..	0·9	..	..	..	0·3	..	0·3	..	..	..	1·6	..	1·5	1·0	4·0	1·2	..	..	..	2·6	4·0	2·7	..	..	..	..	..	..	..	..	..	2·6	4·0	2·7
Congenital Heart,	0·3	..	0·3	1·0	..	0·9	..	..	..	0·3	..	0·3	1·6	..	1·5	0·3	..	0·3	..	..	..	1·9	..	1·8	..	..	..	..	..	..	..	..	..	1·9	..	1·8
Prematurity,	17·0	15·9	16·8	2·9	4·0	3·0	1·6	4·0	1·8	..	4·0	0·3	21·7	27·7	22·1	1·3	4·0	1·5	0·3	..	0·3	23·3	31·7	23·9	..	..	..	..	..	..	..	..	..	23·3	31·7	23·9
Atrophy, Debility, & Marasmus	0·6	..	0·6	0·6	..	0·6	1·0	..	0·9	1·0	..	0·9	3·8	4·0	3·8	1·6	.	1·5	3·2	11·9	3·8	8·6	15·9	9·1	4·5	11·9	5·0	0·6	..	0·6	0·3	4·0	0·6	14·0	31·8	15·3
Atelectasis,	2·5	4·0	2·4	0·3	..	0·3	0·3	..	0·3	..	..	..	3·2	4·0	3·2	..	..	..	..	..	..	3·2	4·0	3·2	..	..	..	..	..	..	..	..	..	3·2	4·0	3·2
Injury at Birth,	1·9	..	1·8	..	..	..	..	..	..	..	..	..	1·9	..	1·8	..	..	..	..	..	..	1·9	..	1·8	..	..	..	..	..	..	..	..	..	1·9	..	1·8
Syphilis,	..	..	..	..	..	..	0·3	..	0·3	0·3	..	0·3	0·6	..	0·6	0·3	..	0·3	..	4·0	0·3	0·9	4·0	1·2	..	..	..	..	..	..	..	..	..	0·9	4·0	1·2
Burns and Scalds,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·3	..	0·3	0·3	..	0·3
Suffocation,	..	..	..	..	..	..	0·3	..	0·3	..	..	..	0·3	..	0·3	..	..	..	..	..	..	0·3	..	0·3	..	..	..	..	..	..	..	..	..	0·3	..	0·3
Other Accidents,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other Causes,	1·0	7·9	1·5	..	..	..	0·3	..	0·3	0·3	..	0·3	1·6	7·9	2·1	..	..	..	..	..	..	1·6	7·9	2·1	0·6	..	0·6	0·3	..	0·3	0·3	..	0·3	2·9	7·9	3·3
All Causes,	24·5	35·8	25·2	5·4	4·0	5·4	6·0	4·0	6·0	3·1	4·0	3·3	41·4	51·6	42·3	9·6	16·0	10·1	8·9	19·9	9·8	59·9	87·4	62·2	20·7	27·8	21·2	13·2	23·8	14·4	11·0	12·0	11·4	105·2	151·0	109·2

* This column includes all Death-rates in preceding columns.

Table XVII.—Aberdeen.—Infant Mortality.—*Years* 1915-1925.

(Corrected for transferred deaths.)

Year.	No. of Births.	Births per 1,000 of Population.	Deaths of Infants under 1 year.	Deaths of Infants under 1 year per 1,000 Births.	No. of Survivors.	Survivors per 1,000 of Population.	Death-Rates among Children under 1 Year of Age from Chief Causes per 1,000 Births.									Death-Rates from All Causes, per 1,000 Births, at Ages		
							Prematurity, Congenital Defects, and Dis. of Early Infancy.	Dis. of Digest. System, Wasting and Debility, Convulsions.	Bronchitis and Pneumonia.	Common Zymotic Diseases.				Tuberculosis.	Syphilis.	Suffocation.	Under 2 Weeks.	Above 2 Weeks and under 6 Months	Above 6 Months and under 1 Year.
										Measles.	Whooping Cough.	Diphtheria.	Scarlet Fever.						
1925 . .	3390	21·4	368	109	3022	19·1	34	37	18	4	6	1	0	3	1	0·3	31	53	25
1924 . .	3437	21·8	421	122	3016	19·1	33	36	22	6	8	1	0	3	2	2	33	57	32
1923 . .	3766	23·6	391	104	3375	21·2	30	42	18	3	1	0	0	3	3	1	33	51	20
1922 . .	3969	24·8	527	133	3442	21·5	31	37	28	10	12	0·3	0	2	4	1	32	63	38
1921 . .	4254	26·6	460	108	3794	23·7	30	42	22	1		1	0	1	2	1	31	60	18
1920 . .	4868	30·3	591	121	4277	26·7	33	42	25	3	4	0·2	0·2	2	4	1	31	69	21
Average 1920-1924	4059	25·3	478	118	3581	22·3	31	40	23	5	5	0·5	0·04	2	3	1	32	60	26
1919 . .	3379	21·0	399	118	2980	18·5	40	37	21	0·3	4	1	0	2	4	2	39	54	25
1918 . .	2721	16·8	390	143	2331	14·4	33	54	26	4	7	1	0	3	3	1	29	78	36
1917 . .	2880	17·8	399	139	2481	15·3	26	49	28	7	6	1	0	5	5	2	27	73	39
1916 . .	3546	21·8	398	112	3150	19·4	34	35	17	1	4	1	0·3	2	5	3	33	56	23
1915 . .	3784	23·2	654	173	3130	19·2	33	57	35	12	11	2	2	6	2	3	34	81	58
Average 1915-1919	3262	20·1	448	137	2814	17·4	33	46	25	5	6	1	0·5	4	4	2	32	69	36
Average 1915-1924 ten years)	3660	22·7	463	128	3198	19·8	32	43	24	5	6	1	0·3	3	3	1	32	65	31

The particulars regarding the live-births and still-births notified during the year to the Health Department are as follows:—

Attended by	No. of Live Births.	No. of Still Births.	No. of Still Births per 1,000 Live Births.
Midwives,	752	20	27
Maternity Hospital—			
(*a*) In Wards,	457	50	109
(*b*) At Home,	132	1	8
Medical Practitioners,	2,162	65	30
Not attended,	4	...	...
TOTAL,	3,507	136	39

The bodies of 69 still-born children or children who had died soon after birth were examined for spirochetes, which were found in three cases, giving a percentage of 4·3. Arrangements were made to have the mothers of these children in which spirochetes were found treated at the Venereal Centres.

MATERNITY MORTALITY.

There were 21 deaths of women from causes associated with pregnancy or childbirth, including all deaths, whatever the precise cause, within four weeks after child-birth (or later if illness originated in the puerperium). All these deaths were inquired into by the Health Visitors, or information regarding them was obtained from the attending medical practitioners, who co-operate in giving the desired information.

YEAR.	NUMBER OF BIRTHS (Corrected for Transfers).	MATERNAL DEATHS.		PUERPERAL SEPSIS.	
		Number of Deaths.	Rate per 1,000 Births.	Number of Deaths.	Rate per 1,000 Births.
1925	3,390	21	6·2	9	2·7
1924	3,437	19	5·5	6	1·7
1923	3,766	24	6·4	8	2·1
1922	3,969	30	7·6	12	3·0
1921	4,254	27	6·3	6	1·4
1920	4,868	38	7·8	5	1·0
Aver. 1920-24	4,059	27	6·7	7	1·8

It will be seen from the Table that during 1925 there were 6·2 maternal deaths per 1,000 births, and of these the deaths from sepsis were 2·7 per 1,000 births.

In two cases death occurred before confinement took place, and in two others labour was stated to have occurred prematurely. Eight patients died in their own homes, and thirteen in institutions.

As far as can be ascertained from the records, the confinement which proved fatal was the first in six cases. Nine City patients died from puerperal sepsis, and one other from outside the City died from this cause.

REPORT UNDER THE MIDWIVES (SCOTLAND) ACT, 1915.

The report for the year 1925 under the Midwives (Scotland) Act, 1915, which has already been transmitted to the Central Midwives Board, is herewith submitted :—

The number of midwives who, during the year, intimated their intention to practise in the district was 29.

Births in Area or District.

Total Number of Births during 1925.	Total Number of Deaths of New-born Children (within ten days) during 1925.	Actual Number of Births attended by Midwives during 1925.	Actual Number of Deaths of New-born Children (within ten days) occurring in the practice of Midwives during 1925.	Actual Number of Cases not attended by a Doctor or Midwife during 1925.	
				Births.	Deaths.
Live—3,507 Still— 136	104	Live—752 Still— 20	17	Live—4 Still—0	1 0

Cases of Ophthalmia Neonatorum.

Total Number of Cases during 1925.	Actual Number of Cases occurring in the practice of Midwives during 1925.	Actual Number of Cases occurring where confinement not attended by a Doctor or Midwife during 1925.
59	23	0

Cases of Puerperal Sepsis.

Total Number of Cases during 1925.	Total Number of Deaths during 1925. (Uncorrected for Transfers.)	Actual Number of Cases occurring in the practice of Midwives during 1925.	Actual Number of Deaths occurring in the practice of Midwives during 1925.	Actual Number of cases occurring where confinement not attended by a Doctor or Midwife during 1925.	
				Cases.	Deaths.
18	10	5	1	0	0

Cases of Still-birth (Dead Born).

Total Number of Cases during 1925.	Actual Number of Cases occurring in the practice of Midwives during 1925.
136	20

Cases of Emergency.

Notifications were received from midwives of having in 172 cases sent for medical assistance. In all cases medical assistance was obtained. In 125 cases, the assistance was required for the mother, and in 48 cases for the child :—

Summary of Cases.

1. During pregnancy,	15
2. During parturition,	90
3. After parturition,	20
4. For infant,	48
Total,	173

£154 9s. 6d. was paid to doctors for the above services.

General Report on the Working of the Act.

During the year the Act has worked smoothly in this area. It was not found necessary to suspend any midwife from practice. The midwives attended 21 per cent. of the confinements in this area.

At the end of the year the two senior midwives resigned owing to failing health.

Home Visitation.

A record of the number of first visits and re-visits to infants under 1 year of age, to children in the 1-5 year period, and to expectant mothers, together with a measure of prematurity, of the nature of infant feeding, and of attendances at the ante-natal clinic, is here submitted:—

(1) Infants—

(*a*) Number of first visits, 3,153 (legitimate, 2,912; illegitimate, 241).

(*b*) Number of re-visits, 35,769 (legitimate, 33,615; illegitimate, 2,154).
Visits by Voluntary workers, 172.

(*c*) Number of Infants at age of six months—

(1) Breast fed,	1,014	48 per cent.
(2) Bottle fed,	880	41 ,,
(3) Breast plus bottle,	128	6 ,,
(4) Breast plus food,	52	2 ,,
(5) Bottle plus food,	65	3 ,,
(6) Food,	2	
Total,	2,141	

(*d*) Number of infants born—

(1) Prematurely,	233	8 per cent.
(2) At full term,	2,779	92 ,,
Total,	3,012	

(2) Children (1—5 years)—

(*a*) Number of first visits, 1,011.

(*b*) Number of re-visits, 3,021.

(3) Expectant Mothers—

(*a*) Number of first visits, 101.

(*b*) Number of re-visits, 149.

(*c*) Number who consulted ante-natal clinic, 90 approx.

Voluntary Health Visitors' Report.

The Voluntary Health Visitors' report, which is separately submitted, indicates the valuable contribution that is made to the work of Maternity and Child Welfare by the voluntary workers.

Ante-Natal Consultations.

The extent and nature of the ante-natal work undertaken during the year at the Maternity Hospital Ante-Natal Annexe (consultations twice weekly, of about two hours' duration) and at the Child Welfare Clinics (daily consultations) is summarised as follows:—

	Maternity Hospital Ante-Natal Annexe.	Child Welfare Clinics.
Total Number of Attendances,	1,402	469
Total First Attendances,	555	357
Number of First Cases—		
Referred to Ante-Natal Ward,	235	—
Referred to family doctor or otherwise,	80	26
Treated at Clinic,	233	300
Referred to Maternity Hospital Ante-Natal Clinic	—	31
Not Pregnant,	7	—
Total First Attendance,	555	357

Post-Natal and other Consultations.

There were 516 first attendances and 486 re-attendances at post-natal and other consultations during the year.

Child Welfare Consultations.

The extent and nature of the work done at the Child Welfare consultations can be summarised as follows:—

Name of Centre.	Number of Weekly Sessions.	Duration (hrs.).
Woodside,	1	1
Charlotte Street,	2	2 to 2½
Torry,	1	1
Old Aberdeen,	1	1
Holburn (voluntary),	1	1
Castlegate,	3	1½ to 2½

(*a*) Total number of attendances—(1) Under 1 year of age,		3,523
(2) Over 1 year of age,		2,090
(*b*) Number of first attendances—(1) Under 1 year of age,		1,168
(2) Over 1 year of age,		822

(*c*) Illnesses recorded—	Children under 1 year.	Children over 1 year.
Digestive System—Feeding,	51	5
Vomiting,	73	15
Enteritis,	103	55
Constipation,	87	14
Malnutrition,	139	62
Thrush,	21	—
Parasitic worms,	2	17
Respiratory System—Nasal catarrh,	40	5
Bronchitis,	43	36
Pneumonia,	1	1
Circulatory System,	—	3
Nervous System,	3	7
Skin—Infective Conditions,	15	33
Other,	93	41
Venereal Disease—Syphilis,	3	—
Dental caries,	—	90
Genito-urinary System,	3	12
Eyes—Acute infectious,	22	11
Refractive errors,	2	17
Ears,	25	23
Nose and Throat—Tonsils and adenoids,	1	32
Other,	—	2
Infectious diseases,	8	19
Tuberculosis,	—	—
Enlarged glands,	10	31
Congenital malformations,	56	6
Accidents,	3	6
Rickets,	7	64
Hernia,	49	11
Vaccination,	190	13
Inspection,	1	31
Diphtheria and Scarlet Fever prophylactic inoculation,	46	113
Normal,	23	—
Various,	48	47
Total,	1,168	822

SPECIAL TREATMENT CENTRES.

(1) *Teeth.*—The Dental Clinic which functions under the joint arrangement with the Education Authority and the Town Council provided the following services:—

(*a*) Number of attendances—(1) Mothers, ... 191 (130 cases).
(2) Children, ... 112 (104 cases).

(*b*) Classified summary of Conditions remedied—

	Extractions.	Local Anaesthetic.	General Anaesthetic.	Fillings.
(1) Mothers,	976	38	143	7
(2) Children,	388	10	97	1

(*c*) Number of Dentures supplied—*Nil.*

(*d*) Net Cost of Dentures less sums recovered—*Nil.*

(2) *Eyes.*—The Ophthalmic Clinic which functions under the joint arrangement with the Education Authority and the Town Council, and is confined to the treatment of cases suffering from refractive defects, &c., was utilised to the extent of providing treatment for 14 cases of strabismus. In 16 other cases treatment was obtained by the parents directly from the Aberdeen Royal Infirmary or Eye Institution, and several other cases seen at the Child Welfare Clinics were asked to come up later for examination, as the children were too young to wear glasses or the defect was slight.

(3) *Other Ailments.*—No records available.

(4) *Provision of Insulin.*—500 units of insulin were obtained for a case in the Ante-Natal Ward of the Maternity Hospital, at a cost of 10s.

Day Nurseries, Kindergartens, and Play Centres.

The Day Nursery at Charlotte Street undertakes the main work under this heading, and there is, in addition, a play centre at the Castlegate Child Welfare Centre, which is open daily from 2 to 5 p.m. The attendances and charges at the Charlotte Street Day Nursery are as follows:—

(*a*) Number of Attendances—(1) Under 1 year of age, ... 1,413
(2) Over 1 year of age, ... 6,220

(*b*) Charges made—5d. per day for one child ; 9d. per day for two children.

(*c*) Receipts—£153 8s. 11d.

Food and Milk.

During the year, food and milk were supplied to the following extent:—

(*a*) Number of Applicants for Food or Milk—(1) Mothers, ... 215
(2) Children. 275

(*b*) Number of Cases certified on medical grounds as requiring Food or Milk—
(1) Mothers, ... 199
(2) Children, ... 251

(*c*) Number of Cases under (*b*) certified as necessitous—(1) Mothers, . . . 199
(2) Children, . . . 251

(*d*) Gross Cost, £958 2s. 9d. Sums Recovered, £318 3s. 5d. Net Cost, £639 19s. 4d.

(*e*) Information as to supply of Milk Substitutes—

Milk substitutes in the form of Glaxo were supplied to 36 recipients (not included in (*b*)) at cost price on necessitous grounds. Cod Liver Oil Emulsion, Glaxovo, Roboleine, and Virol were supplied at cost price or free, at the discretion of the Medical Officer, where considered necessary. Soup Kitchen Checks, to the number of 1,116, at a cost of 2d. each, were given free to deserving cases, whereby such cases received soup and bread at the Public Soup Kitchen.

Measles and Whooping-Cough.

As regards children under five years of age suffering from measles and whooping-cough, the following information is submitted:—

	Measles.	Whooping-Cough.
(*a*) Number of cases notified (partial notification),	498	602
(*b*) Total number of deaths,	23	53
(1) From measles,	6	7
(2) From sequelæ,	17	46
(*c*) Number of cases removed to hospital,	59	41
(*d*) Number of special domiciliary visits—		
(1) First visits,	198	162
(2) Total visits,	896	735

(*e*) Details of special staff engaged for epidemics—one senior nurse from the City Hospital was engaged practically full time from 1st January to 15th May, 1925, in visiting cases of measles and whooping-cough in their own homes, and these visits were confined to children under five years of age.

Ophthalmia Neonatorum.

Ophthalmia neonatorum is referred to in the sections of this Report dealing with infectious diseases and venereal diseases. The following additional information is submitted:—

Year.	Number of Registered Births.	Number of Notified Cases of Ophthalmia Neonatorum.	Rate per 1,000 Registered Births.
1925	3,535	59	16·7
1924	3,527	69	19·6
1923	3,847	63	16·3
1922	4,038	47	11·6
1921	4,336	100	23·1
1920	5,010	112	22·4
1919	3,458	99	28·6
1918	2,794	39	13·9
1917	2,946	42	14·3
1916	3,596	40	11·1

Cases notified during 1925—		Occurring in the practice of—	
By Medical Practitioners,	19	Medical Practitioners,	22
By Midwives,	20	Midwives,	23
		Maternity Hospital—	
By Maternity Hospital,	8	(*a*) In Wards,	10
By Health Visitors,	12	(*b*) At Home,	4

Number of Cases in which infection was gonococcal—6, or 10 per cent. of cases. Eight cases were treated in residential institutions.

Results.—In six cases the child died while under treatment, but in all these cases the condition of the eyes had improved.

In the remaining 53 cases, a complete cure was obtained.

Epidemic Diarrhœa.

Arrangements are in force by which cases will be largely removed to Hospital with a view to having the disease fully investigated from the bacteriological standpoint. Evidence is accumulating which goes to show that epidemic or summer diarrhœa as occurring in Aberdeen is due to infection with *B. dysenteriæ Sonne.*

Maternity Hospitals or Homes.

A statement of the in-patient work of the Maternity Hospital and Annexe, and of the work done from the Hospital in the homes of the patients, is recorded as follows:—

Aberdeen Maternity Hospital.

(1) Ante-Natal Cases—		
(*a*) Number of cases treated,	199	
(*b*) Statement of conditions found—		(*c*) Results of treatment—
Haemorrhage,	14	13 satisfactory; 1 died of pulmonary embolism.
Albuminuria,	22	All satisfactory.
Diabetes,	3	,,
"Dublin,"	26	,,
Pre-maternity rest,	67	,,
Vaginal discharge,	2	,,
Hyperemesis gravidarum,	15	13 satisfactory; 1 developed puerperal insanity; 1 died.
Contracted pelvis—for observation,	4	All satisfactory; 2 cæsarean; 2 induction.
Cardiac trouble,	5	4 satisfactory; 1 had abortion induced—died before delivery.
Eclampsia,	4	Satisfactory.
Placenta prævia,	3	,,
Threatened abortion,	4	,,
Hæmoptysis,	1	,,
Induction of labour,	10	,,
Chorea,	2	,,
Prolapse of cervix,	1	,,
Glycosuria,	3	,,
Diabetes,	3	,,
Gastric ulcer,	1	,,
Epilepsy,	1	,,
Pyelitis,	3	,,
Phlebitis,	1	,,
Hæmaturia,	1	,,
Bacilluria,	1	,,
Oedema of legs,	1	,,
Asthma,	1	,,
(2) Abortions—		
Number of cases,	36	,,
(3) Abnormal or complicated confinements—		
(*a*) Number of cases,	61	
(*b*) Types of cases—		
Placenta prævia,	15	
Contracted pelvis,	5	4 cæsarean; 1 induction—all satisfactory.

Prolapse of cord,	6	
Uncomplicated breech,	10	
Complicated breech,	8	
Footling,	2	
Disproportion of fœtal head,	7	5 craniotomy; 2 decapitation.
Obstructed labour,	3	
Transverse,	2	
Brow,	1	
Hydrocephalus,	1	
Adherent placenta,	1	

(4) Other cases of confinement—

(*a*) Normal deliveries,	396	
(*b*) Without medical attendance,	384	
(*c*) Instrumental deliveries,	56	
(*d*) Cases of Morbidity,	18	Including those in "*c*."
(*e*) Cases of Morbidity, instrumental,	4	
(*f*) Number of deaths,	4	1 uræmia; 1 septic phlebitis; 1 acute parenchymatous nephritis and acute pyelitis; 1 a case of obstructed labour sent in by doctor, and died shortly after admission to hospital.

(5) Receipts from patients—£843 7s. 1d.

(6) (*a*) Infants born—live, 469; still, 50.
(*b*) Twins born—live, 6; still, 0.

(7) Deaths of infants under 10 days old, 10.

(8) Number of cases of puerperal sepsis removed from institution, 0.

Homes for Unmarried Mothers before and after Confinement.

Unmarried mothers in their second or subsequent pregnancies are admitted to Loch Street Home. This Home is centrally situated and permits mothers who are employed to continue breast-feeding. Unmarried mothers with their first pregnancy are admitted to Burnside Home. A total of 36 unmarried mothers was admitted to Loch Street Home, and 36 unmarried mothers to Burnside Home.

Hospitals for Sick Children.

The *Royal Hospital for Sick Children* is a voluntary institution, and surgical and medical cases are freely admitted there. No separate records are kept of the work done in connection with the treatment of children under five years of age, nor are City cases differentiated from County cases.

The *Marasmus Ward at the City Hospital* provides 22 cots for infants suffering chiefly from nutritional disorders. In all, a total of 160 infants was admitted to this ward during the year.

	Under One Year.		Over One Year.
No. in Hospital on 1st January, 1925,	12	...	10
No. of Admissions during Year,	102	...	58
No. in Hospital on 31st December, 1925,	12	...	9
No. Discharged or Died during Year,	102	...	59

The conditions treated, with the results of treatment, were as follows:—

	Cases.	Improved.	Died.
Digestive System—Vomiting,	6	3	2
Enteritis,	33	16	12
Malnutrition,	74	43	26
Respiratory System—Pneumonia,	5	2	2
Bronchitis,	3	3	—
Nervous System,	3	—	—
Skin—Infective conditions,	2	2	—
Other,	2	2	—
Venereal Disease—Syphilis,	4	2	2
Ears Discharging,	1	1	—
Eye Conditions	2	2	—
Tuberculosis	6	1	3
Rickets,	14	10	1
Prematurity,	3	—	3
Congenital Malformations,	2	1	—
Miscellaneous,	1	1	—
	161	91	51

The following are the particulars with regard to those children removed at request of parents, or transferred to other wards:—

Measles,	1
Scarlet Fever,	5
Diphtheria,	4
Removed at request of parents,	9
	19

Average period of residence—45 days.

CONVALESCENT HOMES.

Burnside Home provides accommodation for 11 mothers and 30 infants. The Home is mainly utilised for the admission of married women after their confinement, with the object of providing them with rest and instruction in baby care.

Loch Street Home provides accommodation for 10 mothers and 10 infants, and is mainly used for admission of unmarried mothers both before and after confinement. Details of cases treated are as follows:—

	Burnside Home.	Loch Street Home.
Number of Cases Treated—		
Mothers,	94	44
Children under 1 year,	86	25
Children over 1 year,	9	23
	189	92
Average Duration of Residence—		
Mothers,	28 days.	33 days.
Children,	61 days.	42 days.
Note as to Infectious Disease—		
Diphtheria,	2 cases.	—
Whooping-cough,	2 cases.	—
Puerperal Sepsis,	1 case.	—
Measles,	—	1 case.
	5 cases.	1 case.

BOARDING-OUT.

No arrangements are made for boarding-out City infants.

HOME-HELPS.

In all 7 home-helps were employed for 7 cases, for an average of 55 days, to assist in the homes of mothers during their confinement. In none of the cases was it considered advisable to make a charge for these services, which cost in all £27 10s. for the year.

EDUCATIONAL.

The short courses of Health Lectures for women by Dr. Sandeman and Dr. Howie were continued in 1925. During the spring term Dr. Sandeman delivered these lectures to the mothers attending the Rhondda Mothercraft Guild at Charlotte Street on Thursday evenings, when an average attendance of over 100 was obtained. During the same period Dr. Howie delivered a course of lectures to the mothers attending the Wednesday evening Sewing Meeting, when an average attendance of 70 was obtained.

In the autumn term the ordinary courses of lectures were resumed at Woodside Centre by Dr. Sandeman, and at Torry Centre by Dr. Howie. The following are the particulars of enrolment and attendance at these Centres:—

	No. Enrolled.	Total Attendance.	Average Daily Attendance.	No. making 75 per cent. of Attendances.
Woodside, . . .	57	237	30	22
Torry, ...	35	216	27	25

Women making 75 per cent. of the attendances received certificates of attendance.

Lectures and Demonstrations at Child Welfare Centres.—From September to June, lectures or talks of half an hour's duration on Motherhood and Infant Care are given by the Child Welfare Medical Officer to mothers attending the Centres. At each Centre cooking demonstrations are given once a month by one of the voluntary workers, or by a Domestic Science teacher from the Education Authority's staff, and demonstrations on dressmaking, &c., are given once a month by one of the voluntary workers. The attendances of the mothers at these meetings are given in the annual report of the Aberdeen Mother and Child Welfare Association.

NOTE OF AGENCIES, NOT REFERRED TO ABOVE, ASSOCIATED WITH SCHEME.

The Department works in close co-operation with the Aberdeen Association for Improving the Condition of the Poor. The Shelter for children recently provided by the Association has proved of great value.

OTHER PROVISIONS.

Cases of pneumonia are admitted to the City Hospital when the home conditions are unsatisfactory. Cases of bronchitis are similarly admitted to the City Hospital or to the Sick Children's Hospital. Cases of acute poliomyelitis are treated in the City Hospital during the acute stage of illness, and later receive out-patient treatment at the Sick Children's Hospital.

PORT SANITARY SERVICES.

Trade and Shipping.

The total foreign and coastwise shipping entering the Port during 1925 was 19,497 vessels, of which 2,380 were foreign. The total tonnage of all vessels was 2,029,435, of which 465,218 was foreign.

The British ports with which Aberdeen trades mostly include Blyth, Dundee, Grangemouth, Granton, Hull, Leith, Lerwick, Liverpool, London, Middlesbrough, Newcastle, Seaham, Shields, Sunderland, Tyne, Wick, and the Orkney and Shetland Islands.

The foreign ports with which Aberdeen has most trade include Antwerp, Archangel, Drammen, Gothenburg, Hamburg, Karlshamm, Larvik, New York, Oslo, Riga, Rotterdam, and North African ports.

The principal imports to Aberdeen are of the following nature, viz.:—Cement, coal, esparto grass, fish, flax, flour, granite, hemp, iron, jute, linseed and rape seed, maize, oilcake, oils, phosphates, salts, wood, wood pulp, and cattle, pigs, and sheep.

The principal exports are as follows:—Fish, flour, granite, hides and skins, jute (manufactured), manure (manufactured), oatmeal, oats, oilcake, oils, paper and paper boxes, pitch, preserved provisions, soap, and cattle, pigs, and sheep.

Medical Inspection of Shipping.

The amount of shipping entering the Port during the year, distinguished as foreign and coastwise, together with the number of ships inspected and the nature of the defects and number of notices issued in connection therewith, are set forth in the following table:—

		Number of Vessels.	Tonnage of Vessels.	Number Inspected.		Number reported to be Defective.	Number of Notices issued.
				By the Medical Officer of Health.	By the Sanitary Inspector.		
Foreign—	Steamers	334	290,417	26	178	28	23
	Motor	6	1,469	...	4	...	...
	Sailing	6	442	...	3	...	...
	Fishing	2,034	172,890	...	13	2	1
Total Foreign		2,380	465,218	26	198	30	24
Coastwise—	Steamers	1,908	571,332	...	175	15	9
	Motor	29	11,458	...	3	1	...
	Sailing	3	393	...	3	...	...
	Fishing	15,177	981,034	...	19	3	3
Total Coastwise		17,117	1,564,217	...	200	19	12
Total Foreign and Coastwise		**19,497**	**2,029,435**	**26**	**398**	**49**	**36**

It will be seen that of the 19,497 vessels entering the Port, 17,211 were fishing vessels. In general, it may be said that the danger of fishing vessels importing infectious disease is largely confined to vessels from English or German ports

introducing small-pox or other infectious diseases from these countries. The main sanitary control of fishing vessels has reference to remedying sanitary defects and verminous conditions. Arrangements have been made whereby the sanitary control of fishing vessels will be extended with special reference to dealing with verminous conditions.

In all, 16 persons, from 8 vessels, were removed to hospital for treatment during the year. In March, a case of German measles was removed from one of the vessels belonging to the North of Scotland and Orkney and Shetland Steam Navigation Company. The patient, a seaman, was employed on the steamer. In November, a case of diphtheria in a trawl fisherman was admitted to hospital from the Sailors' Home. Eight cases of scabies and six of vermin were found among the crews of six trawlers entering the Port during the year, and in all these cases the patients and their belongings were removed to the City Hospital for disinfestation, the quarters in the trawlers occupied by the patients being also disinfested.

Rat Destruction—Precautions against Plague.

Trapping of rats within the area of the Harbour Commissioners is regularly carried out, and these rats are submitted to laboratory examination for plague. In all, 43 rats were thus examined in Aberdeen during 1925, but no laboratory evidence of plague infection in the rats was obtained.

The following measure of the work on rat destruction carried out by the two whole-time rat-catchers of the Health Department is submitted:—

Number of pieces of poison bait laid,	85,463.
Number of pieces of poison bait eaten,	26,107.
Liquid poison laid,	14 pints.
Liquid poison consumed,	¾ pint.
Dry poison bait (mice) laid,	31 ounces.
Dry poison bait (mice) eaten,	4¼ ounces.

In addition, liquid poison in the form of red squills was sold by the Health Department to occupiers of business premises and dwelling-houses within the City. The quantity sold amounted to 28 gallons, sufficient for the making up of 54,360 baits; and from the returns obtained from the purchasers it would appear that approximately 51 per cent. of the baits were eaten.

Four ships from plague-infected ports entered Aberdeen during the year:—

Name of Vessel.	Date of Arrival.	Where from.
"Kohiston,"	12th March,	Bombay.
"Warfield,"	16th June,	Bombay.
"Nyanza,"	13th September,	Calcutta.
"Bloemfontein,"	16th November,	Bombay.

None of these vessels from plague-infected ports was either infected or suspected, nor was there any evidence obtained, on inspection or on inquiry at the masters or

among the crews, that the ships were rat-infested. As the ships had been fumigated in European ports on their way to Aberdeen, no deratisation measures were instituted.

In all, seven vessels (not from plague-infected ports) in which evidence was obtained that rats were present on board were dealt with, poison baits to the number of 445 being laid, 121 of these being removed by rats. Fumigation of these vessels was not employed.

Two certificates of fumigation were issued on Form Port 10 in connection with vessels proceeding to U.S.A. ports.

VETERINARY SERVICES.

The activities of the Health Department that are subject for discussion under "Veterinary Services" relate mainly to the control of food supplies, the executive officers for this purpose being the Veterinary Inspector and the Sanitary Inspector, who is also Food Sampling Officer.

Milk Control.

Milk and Dairies (Scotland) Act, 1914.

The Milk and Dairies (Scotland) Act, 1914, as amended by The Milk and Dairies (Amendment) Act, 1922, was brought into operation on 1st September, 1925, and on the same date there came into operation the Milk and Dairies (Scotland) Order, 1925, made by the Scottish Board of Health, as also the Tuberculosis Order, 1925, issued by the Ministry of Agriculture.

In connection with the provisions of the 1914 Act as amended by the 1922 (Amendment) Act and the arrangements to be made for carrying out the duties placed on the Town Council, the following Report was submitted:—

The 1914 Act was passed on 10th August, 1914, but, on account of the European War, its coming into operation was suspended; and it was decided, by the Amendment Act of 1922, that it should come into operation on a day not before the 1st day of September, 1925, the exact day to be fixed by the Scottish Board of Health. Subsequently the Board decided that the Act should come into operation on the 1st day of September, 1925.

A detailed analysis of the provisions of the 1914 Act, as amended by the 1922 Amendment Act, would expand the substance of this report to an inordinate length, and accordingly it may be regarded as sufficient to make a general survey of the new powers and duties of the Town Council under the Act and to make certain proposals relative to the duties of the officers who may be charged with the administration of the Act.

Provisions of the Act.

The essential object of the Milk and Dairies (Scotland) Act, 1914, is to secure the improvement of the milk supply; and the means to be adopted to attain this end consist of registration of approved persons and premises, inspection of premises and cattle, improved methods of production, and restrictions to prevent the spread of milk-borne diseases.

Veterinary Inspector.

The Town Council may, and if required by the Scottish Board of Health shall, appoint a whole-time veterinary surgeon under this Act; and the Town Council shall, subject to the approval of the Board, regulate the duties of the veterinary inspector for the purposes of the Act. In relation to the other duties of the veterinary inspector, and auxiliary to the Milk and Dairies (Scotland) Act, 1914, there also came into operation on 1st September last the Tuberculosis Order of 1925, made under the Diseases of Animals Acts, which provides that notice of intention to slaughter shall be given to the Public Health Local Authority as well as to the owner of the animal in cases where it is intended that the carcase or any part thereof should be disposed of for human consumption.

Laboratory Examinations.

The Town Council may make arrangements for the bacteriological or other examination of specimens and samples taken for the purposes of the Acts. Broadly speaking, the laboratory examinations are devised to test the cleanliness of milk samples, their chemical composition, and for the presence of tubercle bacilli.

The officers of the Town Council are entitled to take samples of milk, and the Medical Officer of Health or Sanitary Inspector or Veterinary Inspector may at all reasonable times require any cow to be milked in his presence and take samples of milk.

Registration.

No person can carry on the business of a dairyman without being registered by the Town Council in respect of such premises, and before granting the registration the Council must get a report on the premises from the Medical Officer of Health, Sanitary Inspector, or other person duly authorised by them, in writing.

The Town Council shall keep a register of dairies and dairymen within their district certificated under this Act in such form as shall be prescribed by the Board.

In respect of any person or premises, the Town Council may refuse to grant a certificate of registration or may revoke such certificate if—

(*a*) The person is or becomes unsuitable to carry on the trade of a dairyman; or

(*b*) The premises are or become unsuitable to the purposes of the trade which is proposed to be carried on, or which is carried on therein.

In the event of a certificate of registration being granted or refused by the Town Council, or only granted provisionally, or if the certificate be revoked, any person aggrieved may appeal to the Sheriff.

Dairy Bye-Laws.

The Town Council are required to make Dairy Bye-laws—

(*a*) For the inspection of cattle in dairies;

(*b*) For prescribing and regulating the structure, lighting, ventilation (including air and floor space), cleansing, drainage, washing and scalding facilities, and water supplies of dairies and their appurtenants;

(*c*) For the prevention of impurities in milk intended for human consumption and for securing the cleanliness and health of the cows and the cleanliness of the persons and clothing of those engaged or assisting in the business, and of the milk, cows, dairies, sculleries, boiler-houses, and all utensils, vehicles, and vessels used for the reception, conveyance, storage, or sale of milk; and

(*d*) For prescribing precautions to be taken by dairymen against infection or contamination.

In this connection the Scottish Board of Health have issued Model Bye-laws for the guidance of Local Authorities.

If the Town Council have reason to believe that another Local Authority from whose district milk is being sent to Aberdeen is not carrying out the provisions of the Acts, then Aberdeen Town Council can make complaint to such other Local Authority, and if such other Local Authority does not remove the cause of complaint within a reasonable time, then Aberdeen Town Council can apply to the Board, who will enquire into the circumstances and who will take such means as they consider necessary for securing that the provisions of the Acts are put into operation by such other Local Authority.

Special Designations Order.

Under the Milk (Special Designations) Order (Scotland), 1922, made by the Scottish Board of Health under Sections 3 and 14 of the Milk and Dairies (Amendment) Act, 1922, every person who proposes to sell milk under special designations as "Certified," "Grade A (Tuberculin tested)," "Grade A," or "Pasteurised," must get a licence from the Town Council.

Certified Milk is milk from a herd which has passed the prescribed tuberculin tests; which contains not more than 30,000 bacteria per cubic centimetre; which contains no coliform bacillus in one-tenth of a cubic centimetre; which contains at least 3·5 per cent. of butter fat; which has not at any stage been treated by heat; and which has been cooled and bottled in sterilised bottles on the producer's premises and is so delivered in sealed bottles to the consumer.

Grade A (Tuberculin Tested) Milk is milk from a herd which has passed the tuberculin tests; which contains not more than 200,000 bacteria per cubic centimetre; which contains no coliform bacillus in one-hundredth of a cubic centimetre; which contains at least 3·5 per cent. butter fat; which has not at any stage been treated by heat; and which is delivered in sealed containers or in sterilised bottles similarly sealed.

Grade A Milk is milk from a herd which has been examined clinically at least three times a year by a Veterinary Surgeon nominated by the Local Authority. This Grade should also contain not more than 200,000 bacteria per cubic centimetre; no coliform bacillus in one-hundredth of a cubic centimetre, and at least 3·5 per cent. butter fat; should not at any stage be treated by heat; and should be delivered in sealed containers or in sterilised bottles similarly sealed.

Pasteurised Milk is milk which has been retained for at least half an hour at a temperature between 145° and 150° F., and has thereafter been immediately passed to a covered cooler and the temperature reduced to 50° F. or less. Such milk need not contain 3·5 per cent. butter fat, but must not contain more than 100,000 bacteria per cubic centimetre, and must contain no coliform bacillus in one-tenth of a cubic centimetre.

Other Regulations and Orders.

The Board of Health are required to make Regulations for the prevention of danger arising to public health from the importation of milk, butter, cheese, or other milk products intended for sale for human consumption or for use in the manufacture of products for human consumption, and such regulations can also provide in connection with such imported milk for the manner in which any tin or other receptacle containing dried, condensed, skimmed, or separated milk is to be labelled or marked, and prescribe the minimum percentages of milk fat and milk solids in dried or condensed milks.

In this connection the Board of Health have already put in force the Public Health (Condensed Milk) Regulations (Scotland), 1923 (No. 2), and the Public Health (Dried Milk) Regulations (Scotland), 1923.

The Scottish Board of Health may also, with the concurrence of the Board of Agriculture, make such general or special Orders for carrying the 1914 Act into operation, including Orders for the following purposes or any of them:—

(*a*) The measure to be taken for cooling milk and otherwise for protecting milk against infection or contamination;

(*b*) The prohibition of the use of colouring matter in milk intended for sale for human consumption and of the addition to milk other than buttermilk intended for sale for human consumption, of skimmed or separated milk or water or any other substance, and of the sale for human consumption of milk to which such an addition has been made;

(*c*) The prohibition of the use of the word "Milk" as the name of any substance not wholly derived from the mammary gland of an animal when such substance is offered for sale, and of the use of the words "Butter" or "Cheese" as the name of any substance not manufactured from milk so derived when such substance is offered for sale;

(*d*) The manner of conveyance of milk intended for sale for human consumption, including the proper fastening, sealing, and identification of churn and vessels used for such conveyance;

(*e*) The regulation of the mixing of the milk in one such churn or vessel with the milk in another such churn or vessel;

(*f*) The labelling or distinctive marking of the receptacles of milk for sale for human consumption.

In this connection the Board have already issued the Milk and Dairies (Scotland) Order, 1925, dealing with provisions against infection or contamination, prohibition of colouring matter, provision as to vessels and conveyance of milk, and labelling of skimmed milk, separated milk, and cream.

Offences.

It is an offence under the 1914 Act—

(1) For any person to consign, sell, offer, or expose or keep for sale for human food, or to use or offer to be used in the manufacture of products for human consumption the milk of any cow which is suffering from—

(*a*) Tuberculosis with emaciation;

(*b*) Tuberculosis of the udder;

(*c*) Any sore on the teats; or

(*d*) Any disease liable to infect or contaminate the milk;

unless he proves that he did not know and had no reason to suspect the milk.

But by the Amending Act of 1922 it is illegal to sell, offer, or expose for sale milk of a cow suffering from tuberculosis of the udder, and the offence is committed although the offender was not aware of his cow suffering from tuberculosis of the udder if it can be proved he could have known by the exercise of ordinary care.

(2) For any dairyman to keep in his dairy a cow which appears to be suffering from—

(*a*) Any sore on the teat accompanied by suppuration or bleeding; or

(*b*) Any disease liable to infect or contaminate the milk; or

(*c*) To keep any cow which to his knowledge is giving tuberculous milk;

without giving written notice thereof to the Town Council.

(3) For any dairyman to have any person or other employee in connection with his dairy, or who resides in the same house as any person so employed, shewing symptoms of any infectious disease without reporting the matter to the Medical Officer of Health.

(4) For any person who is suffering from or shewing symptoms of any infectious disease, or who is suffering from any suppurating sore or from sore throat or diarrhœa, to milk cows or handle milk vessels, without a certificate from a medical practitioner stating that he can do so without risk of spreading disease; and it is also an offence for the dairyman to allow any such person so to do unless so authorised.

(5) It is also an offence for a person who has been in contact with any infectious disease to milk cows or have anything to do with the milk business unless proper precautions against spreading disease are taken, and the dairyman is also guilty if he allows such person so to act without taking such precautions.

It is an offence to add to milk intended for sale any or all of the following:—

(*a*) Colouring matter;

(*b*) Water;

(*c*) Dried or condensed milk;

(*d*) Any fluid reconstituted from (*c*);

(*e*) Skimmed milk; and

(*f*) Separated milk.

It should be specially noted that the offence of so adulterating the milk is committed by the person who actually so adulterates the milk. The master is not, in this instance, liable for the wrong of his servant. The master, however, is responsible not only for himself, but also for his servant or agent, if such milk is sold, offered for sale, or exposed for sale.

It is equally an offence to adulterate skimmed milk or separated milk with—

(*a*) Colouring matter;

(*b*) Water;

(*c*) Dried or condensed milk;

(*d*) Any fluid reconstituted from (*c*);

and also an offence to sell or offer or expose for sale such skimmed milk and separated milk.

There is a provision in the 1922 Act which states that where it appears an offence has been committed in respect of which proceedings might be taken against the purveyor of milk, then if the Fiscal is reasonably satisfied the offence was due to any act or fault of a servant or agent without the consent, connivance, or knowledge of the employer, he must take proceedings against the servant or agent without first proceeding against the employer.

No person can be convicted of any offence relating to the sale of milk in respect of a sample of milk taken after the milk has left his custody and control if it is proved to the satisfaction of the Court that the churn or other receptacle in which the milk was contained was effectively closed and sealed at the time when it left his custody and control, but was not so closed and sealed at the time when it reached the person by whom the sample was taken.

Infectious Diseases.

If there is infectious disease in one district, then the Medical Officer of Health of that district must advise the Medical Officer of Health of any district into which milk is consigned from such infected district of the existence of such disease. The

dairyman is obliged to inform the Medical Officer of Health into what districts he sends his milk, so as to enable such Medical Officer of Health to advise the Medical Officers of the districts into which the milk is consigned.

If the Medical Officer of Health is aware that any person in his district is suffering from infectious disease or from disease attributable to milk supplied from any dairy within the district, then he must visit the dairy and, if necessary, take with him the Veterinary Inspector and report the result of his examination to the Local Authority, and if he is accompanied by the Veterinary Inspector, the Veterinary Inspector must also submit a report.

If the dairy is outside of his district, then he advises the Medical Officer of Health of that district, giving such Medical Officer of Health a statement of the evidence in his possession, then such Medical Officer of Health must go to the dairy in his district, taking with him, if necessary, the Veterinary Inspector, and examine the premises and the persons employed therein.

Before he makes his inspection, however, he is required to advise the Medical Officer of Health who intimated the same to him when he is to inspect, so that such Medical Officer of Health, along with his Veterinary Inspector, may attend the inspection.

The Medical Officer of Health of the district in which the dairy is situated must submit a report to his Local Authority, and if his Veterinary Inspector accompanied him, then the Veterinary Inspector must also send in a report.

The Local Authority must, immediately on receiving the report, have a meeting, due notice of the meeting together with copies of all the reports on the case being given to the dairyman, who will be entitled to attend the meeting, and such Local Authority shall consider the report or reports, together with such evidence that may be submitted by the parties concerned, and such Local Authority must make an Order prohibiting the dairyman from supplying milk or butter from that dairy until the Order is withdrawn, or resolve that no such Order is necessary. If Order made, it must specify grounds on which it is made.

Pending the decision of the Local Authority, the Medical Officer of Health is empowered to make an *interim* Order himself prohibiting the dairyman from supplying milk or butter from the dairy.

Where any such Order applies to a dairy from which milk is supplied to any district other than that in which it is situated, the Local Authority shall transmit a copy of the Order to the Local Authority of every such district.

The Order is withdrawn so soon as the Local Authority consider it advisable to do so.

Power of appeal to the Sheriff is given to any Local Authority or dairyman against any Order or withdrawal of Order or the failure to make an Order.

A dairyman is safeguarded from breach of contract if breach due to an Order, and can claim compensation from Local Authority for damage by reason of such an Order if damage has not arisen by reason of dairyman's default.

Dairymen are obliged, when asked, to give a complete list of the names and addresses of their customers. They are paid for such list at the rate of 6d. for every 25 names. The document is only used for the purposes of the Acts and is treated as a confidential document.

They are also obliged to give a list of the names and addresses of the farmers and dairymen or other parties from whom, during a period to be specified, the milk which they sell or distribute was obtained.

The Local Authority and their Officers have power to enter, inspect, and examine all dairies at all reasonable times, the Medical Officer of Health to examine all persons employed in such dairies, and the Veterinary Inspector to examine all cattle therein.

The Local Authority have the power to authorise the Medical Officer of Health, the Sanitary Inspector, or any other Officer to inspect the cattle and premises from which the occupier sells milk only in small quantities and for their own consumption to persons in his employment or to neighbours, although such occupier is not a dairyman within the meaning of the Act.

The Veterinary Inspector is also entitled, with the consent of the owner, to apply the Tuberculin Test.

The Acts empower Local Authorities to establish and maintain milk depôts for the sale of milk specially prepared for consumption by infants under 2 years of age.

Alteration of Premises.

If premises are used with the consent, express or implied, of a landlord as a dairy, then if the dairyman requires to alter the premises to put them into conformity with the requirements of the Acts, he can do so, and recover from the landlord such proportion of the expenses as are just and equitable under the circumstances. The dairyman must, however, give his landlord notice of the intention to execute such alterations or improvements, in which case the landlord can carry out the improvements himself and charge such proportion against the tenant as is just and reasonable, regard in each case being had to the terms of the let.

Any question as to the necessity for such alterations or improvements or the proportion of the expenses to be paid by the landlord or tenant, in default of agreement, to be determined by a single arbiter appointed by the Board of Agriculture. Such arbiter must, as far as practicable, act on his own knowledge and experience, and shall not, except in such cases where the Board of Agriculture direct, hear counsel.

Penalties.

The Acts provide for pecuniary penalties for breaches of the Act, and, in addition, the Sheriff may by summary order suspend a dairyman's Certificate of Registration.

Administration of Act.

In connection with the administration of the Act, the Town Council will have to determine the arrangements that are to be made for carrying out its statutory requirements.

Medical Officer of Health.

The Act constitutes a new public health code relating to the sanitary supervision of milk, and it is suggested that the Town Council should hold the Medical Officer of Health officially responsible for the administration, in Aberdeen, of the Milk and Dairies (Scotland) Act, 1914, as amended by the Milk and Dairies (Amendment) Act, 1922, and that the duties to be allocated to the other Officers should be subject to the control of the Medical Officer of Health.

Veterinary Inspector.

(1) It is suggested that, in terms of Section 3 (1) of the 1914 Act, Mr. James McAllan, M.A., B.Sc., M.R.C.V.S., should be appointed Veterinary Inspector under the Act. Mr. McAllan will carry out his duties in accordance with Regulations, which must be issued by the Town Council in terms of Section 3 (5) of the Act; and it is suggested that it be remitted to the Town Clerk and the Medical Officer of Health to frame draft Regulations.

(2) It is suggested that the Veterinary Inspector be the Officer appointed in writing by the Town Council to inspect byres or dairies other than milk shops, as may be required for purposes of the Milk and Dairies (Scotland) Act, 1914, and any Bye-laws and Orders issued under that Act.

Sanitary Inspector.

(1) It is suggested that the Sanitary Inspector be the Officer appointed in writing by the Town Council to inspect milk shops or dairies other than byres, as may be required for the purposes of the Milk and Dairies (Scotland) Act, 1914, and any Bye-laws and Orders issued under that Act.

(2) It is suggested that the Sanitary Inspector be authorised to keep the Register of Dairies and Dairymen, in terms of the Milk and Dairies (Scotland) Act, 1914, and the Milk and Dairies (Amendment) Act, 1922.

Laboratory Services.

It is suggested that the laboratory services arising out of the 1914 Act, as amended by the 1922 Amendment Act, be provided by the City Bacteriologist and City Chemist at the City Hospital Laboratory.

Reports on Premises.

It is suggested that the Medical Officer of Health and Veterinary Inspector be authorised in writing to prepare jointly the report on byres or dairies other than milk shops which the Town Council require before considering any application for registration; and that similarly the Medical Officer of Health and Sanitary Inspector be authorised in writing to prepare jointly the report on milk shops or dairies other than byres which the Town Council require before considering any application for registration.

BYE-LAWS.

It is suggested that it be remitted to the Town Clerk, the Medical Officer of Health, the Veterinary Inspector, and the Sanitary Inspector to frame draft Bye-laws for submission to the Public Health Committee.

J. PARLANE KINLOCH,
Medical Officer of Health.

CITY HEALTH DEPARTMENT,
ABERDEEN, *15th February*, 1926.

In connection with the Milk and Dairies (Scotland) Act, 1914, the following notice to dairymen was prepared:—

MILK AND DAIRIES (SCOTLAND) ACT, 1914.

Prevention of Spread of Infectious Diseases by Milk.

NOTICE TO DAIRYMEN.

One of the chief purposes of this Act, which is now in operation, is to secure the prevention of the spread of infectious disease through milk supplies; and with this end in view the dairyman and his employees should make themselves familiar with the Sections of the Act which are printed below.

The following statement of (*a*) the duties imposed by the Act, (*b*) the symptoms of certain infectious diseases, and (*c*) the methods of preventing certain infectious diseases, has accordingly been prepared for the guidance of those associated with the production, sale, and distribution of milk.

DUTIES IMPOSED BY THE ACT.

(1) It is the duty of the dairyman to *report to the Medical Officer of Health* immediately he becomes aware that anyone residing at the dairy or employed in connection with the dairy, himself and his family included, *shows symptoms of any infectious disease.*

(2) It is unlawful for any person who is suffering from or showing signs of *any infectious disease,* or who is suffering from any *suppurating sore* or from *sore throat* or *diarrhœa,* to milk cows or handle milk vessels, unless the person concerned has obtained a medical certificate stating that there is no danger of infectious disease and that the person may continue at work without risk of spreading disease.

The dairyman is made responsible for seeing that these precautions are observed, and he should report any such occurrence to the Medical Officer of Health.

(3) The dairyman is thus required to pay particular attention to the health of his employees, especially those whose duty it is to milk cows, or to handle milk or milk vessels, or to engage in the making of butter, cheese, ice cream, or other milk products. The employees should (*a*) report to the dairyman whenever they contract any illness such as described above, and also (*b*) inform him whenever they become aware that infectious disease has occurred in the house in which they reside.

(4) It is unlawful for employees who have been in contact with a case of infectious disease to continue at work *unless proper precautions are taken to prevent the spread of the disease.* The dairyman is also responsible for this requirement, and accordingly in all such cases he should consult the Medical Officer of Health as to the proper precautions to be taken in the case of workers who have been in contact with an infectious case.

(5) It is to be noted that a "dairy" includes not only creamery, farm, farmhouse, cowshed, byre, milk store, and milk shop, but also premises used for the making of butter, cheese, ice cream, or other milk product.

Symptoms of Certain Infectious Diseases.

Scarlet fever, diphtheria, enteric fever, and various *dysenteries* and *diarrhœas* are the acute infections most commonly carried by milk, and it is important that every dairyman and dairy worker should be aware of the early symptoms of these diseases. Any dairyman or worker in a dairy who at any time suffers from *sore throat, diarrhœa, suppurating sores,* or *any of the following symptoms,* should at once report to his employer and consult a doctor :—

Scarlet Fever.—The disease begins suddenly as a rule. There is a feeling of headache and sickness with vomiting, and a certain amount of pain in the muscles of the limbs and back. At the same time there is commonly a complaint of sore throat, and in a day or two the rash has developed all over the body. The occurrence of vomiting and sore throat is very significant of scarlet fever. Vomiting may occur in quinsy and diphtheria, but it is not common to them. Vomiting and sore throat are common in scarlet fever. The sore throat begins in the tonsils, it spreads to the soft palate, and extends on to the hard palate. The neck glands opposite the tonsils at the angle of the jaw enlarge as the sore throat develops. The tongue is thickly coated at the beginning of the fever. The tongue during the first two days gives a much thicker coating than is obtained in most other fevers; the tongue then peels; and finally a red, raw-looking tongue is obtained like a red strawberry. The rash covers the body and limbs, appearing in some cases as a fine flush, and in other cases it develops so markedly as to have a lobster-red appearance. In some cases the rash fades in a day, in others it lasts for nearly a week. Peeling of the skin begins after a week of illness over the skin from the neck downwards. In two or three weeks' time the hands and feet are involved in the peeling process. Sometimes the sore throat is so mild as to pass unnoticed and the rash is not observed, but peeling may take place later and is specially noticeable on the hands and feet. After scarlet fever, discharges from the nose or ear, or a suppurating sore, are highly infectious.

N.B.—Individuals who are or have been in contact with a case, although apparently not themselves affected, may carry the germ of scarlet fever in their throats and so infect milk.

Diphtheria.—In older children and in adults diphtheria is mainly a disease of the throat, but it sends its poisons all over the system. In younger children it may choke the windpipe and cause croup, suffocation, and death. The onset of diphtheria is very variable. On looking at the throat the tonsils are seen to be spotted or covered with an exudate or membrane of a white or yellow appearance, and this appearance of the throat is the classical sign of diphtheria. The onset of the disease is very variable. Sometimes it begins with definite sore throat and headache, but in the majority of cases the onset is very insidious. In such cases the child may have the membrane on the throat, yet he feels well and his colour is good, and then later as the disease develops he is gravely ill. As a matter of routine examination of children in general, any feverish child should have the throat examined. The common story of the onset of diphtheria is that the child has been off colour and has had loss of appetite for a few days. The poison from the sore throat frequently causes the glands of the neck to become enlarged and painful. If the disease is not treated, heart failure may occur, or paralysis of the muscles of the eyes and limbs may develop.

N.B.—Individuals who are or have been in contact with a case, although apparently not themselves affected, may carry the germ of diphtheria in their throats and so infect milk.

Other Spray-borne Infections.—Any dairyman or worker in a dairy suffering from *active pulmonary tuberculosis* should be prohibited from carrying on his occupation, and any milk worker suffering from a *chronic cough* should consult the Medical Officer of Health.

Enteric or Typhoid Fever.—The germ of this dangerous disease is found in the motions and urine of the patient. The hands are thus easily contaminated, so that it is not difficult to pass the germs on to the milk. Occasionally in a healthy person the germs appear in the motions and urine, and such a person may quite unwittingly infect milk. Scrupulous cleanliness of the hands is, therefore, an essential for all milk workers. Often at the beginning of enteric fever, the patient feels out of sorts and unwell. There is headache, pain in the back, feverishness, and increasing weakness, associated with either constipation or diarrhœa. The fever runs its course for three weeks or more, and there is always danger of serious complications such as hæmorrhage or perforation.

Dysenterias and Diarrhœas.—A person suffering from even a passing diarrhœa may readily infect his hands and so convey infection to milk, and thus occasion a widespread outbreak of diarrhœal disease. The main symptom of food-poisoning infections is diarrhœa, and similarly diarrhœa is the classical symptom of the specific dysenteries and of summer diarrhœa or British cholera. The germs of all these infections are contained in the motions. At the first suggestion of diarrhœa, a milk worker must cease to have any association with milk, if outbreaks of milk-borne diarrhœas are to be prevented.

Prevention of Certain Infectious Diseases.

Prevention of Diphtheria and Scarlet Fever.—As a result of recent medical research it is now possible to secure active protection against both diphtheria and scarlet fever by means of a single series of injections, the material for this purpose being administered in three small injections under the skin at weekly intervals. The injections are very harmless, they produce at the most a little stiffness of the arm for a day or two, *they produce no sores*, and the person injected can carry on as usual. By actively protecting themselves and their families by means of this new device, milk workers will not only save themselves and their children from contracting these diseases, but will go far to limit the number of milk-borne outbreaks of diphtheria and scarlet fever.

Provisions of the Act.

Section 2—Definition.

Expressions used in this Act shall (unless such meaning is inconsistent with the context) have the meanings assigned to them in the Public Health (Scotland) Act, 1897 (60 and 61 Vict., c. 38), subject to the following additions and modifications:—The word "dairy"* shall include any creamery, farm, farmhouse, cowshed, byre, milk store, milk shop, or other premises from which milk* is sold or supplied for sale or in which it is kept for the purposes of sale, or which are used for the making of butter, cheese, or other milk products for human consumption for purposes of sale, but shall not include premises from which a person sells milk only in small quantities and for their own consumption to persons in his employment or to neighbours; the word "dairyman" shall include any occupier of a dairy and any person carrying on the trade of a cow-keeper or purveyor of milk or maker of butter or cheese or other milk products for human consumption for purposes of sale, but shall not include a person who sells milk only in small quantities and for their own consumption to persons in his employment or to neighbours, and if any question shall arise as to whether a dairy or dairyman is entitled to exemption under this provision, such question shall be determined by the Scottish Board of Health, hereinafter referred to as the Board, whose decision shall be final; and the word "milk"* shall include cream, skimmed milk, separated milk, and buttermilk.

* In terms of the Aberdeen Police and Improvement Act, 1900, "milk" includes ice cream or any similar commodity manufactured or made either wholly or in part from or with milk or cream.

Section 15—Notification of Employees Suffering from Illness.

If any person resident at or employed in connection with any dairy, or who resides in the same house as any person so employed, shall show symptoms of any infectious disease, the dairyman, on becoming aware thereof, shall forthwith report to the Medical Officer of Health for the district the existence of such illness.

Section 17—Persons Suffering from Disease not to Assist in Dairy.

(1) It shall not be lawful for any person to milk cows or to handle milk vessels who is suffering from or showing symptoms of any infectious disease, or who is suffering from any suppurating sore or from sore throat or diarrhœa, and has not been authorised by a certificate from a duly qualified medical practitioner bearing that he may milk cows or handle milk vessels without risk of spreading disease; and it shall not be lawful for a dairyman to allow any such person so to do unless authorised as aforesaid. The holder of any such certificate shall, if so required, produce it for inspection by the Medical Officer of Health.

(2) It shall not be lawful for any person who has recently been in contact with a person who is suffering from any infectious disease, or for any person who resides in a house where any infectious disease exists, to milk cows or to handle milk vessels or in any way to take part or assist in the conduct of the trade or business of a dairyman, unless proper precautions against spreading such disease are taken; and it shall not be lawful for a dairyman to allow any such person so to do without taking such precautions.

Section 24—Penalties.

(1) Every person who shall fail to comply with any of the requirements of this Act or of any Order made thereunder, or who obstructs any person acting under the authority or employed in the execution thereof, shall be guilty of an offence under this Act. Every person who shall be guilty of an offence under this Act shall be liable for every such offence, except where otherwise provided, to a penalty not exceeding Ten Pounds, and, if such offence shall continue, to a further penalty not exceeding Five Pounds for every day during which the offence continues.

(2) In addition to any pecuniary penalty imposed on any dairyman for an offence against this Act, or against any Order or Bye-law made under this Act, the Sheriff may by summary order suspend his certificate of registration in respect of any premises for such period as may be specified in the Order, or cancel such certificate, but in the latter case without prejudice to the right of the dairyman to make application for a new certificate of registration. The dairyman shall be entitled to appeal against the order of the Sheriff to the Lord Ordinary on the Bills in manner provided by Section One hundred and fifty-six of the Public Health (Scotland) Act, 1897.

The Milk and Dairies (Scotland) Order, 1925.

Article 10.—Every person in or about a dairy having access to the milk or to the churns or other milk receptacles, as soon as he becomes aware that any member of his household is suffering from an infectious disease, shall immediately notify the dairyman occupying such dairy of the fact.

J. PARLANE KINLOCH,
Medical Officer of Health.

City Health Department,
Aberdeen, *February*, 1926.

In terms of the Council Minutes of 1st March, 1926, the foregoing Report and Notice to Dairymen were both approved.

Certified Milk.

In 1925, two firms of milk retailers, viz., the Aberdeen Dairy Company, Ltd., and Mr. John Bain, 22a, Broomhill Road, had their licences to retail Certified Milk renewed, and a third firm of milk retailers, viz., Kennerty Dairy was licensed.

Market Milk.

The policy of the Public Health Department is to secure the general use of certified milk, and towards that end every effort continues to be made to raise the standard of cleanliness of ordinary market milk. For several years it has been the practice of the Health Department to subject market milk as retailed in Aberdeen to frequent analysis, both bacteriological and chemical, and to communicate the results of the analyses to the dairymen concerned within the City and to the Medical Officers of Health of all the Counties producing milk from Aberdeen. These Medical Officers issue copies of these laboratory returns to the Sanitary Inspectors of the different districts, who communicate the results to the various producers. The Sanitary Inspectors find this information most useful in their dealings with the producers, many of whom on the basis of these returns have entered into a healthy rivalry with their neighbours in endeavouring to lower the bacterial counts of their milk. All the milk samples for laboratory analysis are taken from the milk consignments immediately on their delivery from the producers at the City dairies. In 1925, a total of 132 milk samples was examined for the presence of tubercle bacilli, and reference to the accompanying table shows that tubercle bacilli were present in 4 of the samples, or 3·0 per cent. Of 176 samples examined in 1924, 5·1 per cent. contained tubercle bacilli; and of 230 samples examined in 1923, 5·7 per cent. contained tubercle bacilli. As regards the general bacterial examination of market milk, a total of 171 samples was examined during 1925, and the table shows that 142 of these samples, or 83·0 per cent., as compared with 59·2 per cent. in 1922, did not contain more than 200,000 organisms per cubic centimetre. On the basis of not more than 200,000 organisms per cubic centimetre of milk (it is to be noted that this is the bacterial standard for Grade A (T.T.) Milk and Grade A Milk) being taken as a standard of cleanliness for market milk, it would appear that within a period of three years there has been a 24 per cent. improvement in the cleanliness of ordinary sweet milk.

A record of the work done during 1925 in connection with the chemical examination of market milk is contained in the Annual Report of the Sanitary Inspector.

Bacteriological Examination of Milk Samples.

Year.	Tubercle.			General Bacteria—No. in 1 c.c.							
	No.	Pos.	Neg.	No.	Not exceeding						Exceeding
					10,000.	50,000.	100,000.	200,000	1,000,000.	5,000,000.	5,000,000.
1925	**132**	**4**	**128**	**171**	**27**	**67**	**31**	**17**	**21**	**7**	**1**
1924	176	9	167	274	14	106	54	24	47	15	14
1923	230	13	217	392	23	113	78	39	90	35	14
1922	219	11	208	478	18	140	70	55	112	55	28

Dairy Herds.

The number of dairy herds in the City is showing a gradual decline. During 1925, there were only nineteen herds, the average number of cows being 190. The herds were inspected once a month. The sanitary condition of the premises was, on the whole, satisfactory.

Meat Control.

Meat Inspection.

There are five slaughter-houses in the City, and, as has been pointed out in preceding Reports, it is impossible to secure adequate inspection of meat in five widely separated slaughter-houses.

The number and class of animals killed in the five slaughter-houses during the year were as follows:—

Cattle.					Sheep.		Pigs.
Oxen.	Heifers.	Cows.	Bulls.	Calves.	Sheep.	Lambs.	
25,745	16,238	468	445	52	48,541	3,166	2,576

The following table gives the number of carcases inspected and the weight of meat seized as unfit for human food during the year:—

	Oxen.	Bulls.	Cows.	Heifers.	Calves.	Sheep.	Pigs.
Number of carcases inspected, .	*	445	468	*	52	*	2,576
Number of carcases seized wholly—							
(1) For tuberculosis, . .	50	1	82	42	1	0	11
(2) For other diseases, . .	7	1	64	14	6	56	40
Number of carcases of which portions were seized—							
(1) For tuberculosis, . .	138	2	32	127	0	0	35
(2) For other diseases, . .	104	4	101	51	2	7	56
Total weight of meat seized, .	67,506 lbs.	2,000 lbs.	91,471 lbs.	53 569 lbs.	668 lbs.	2,343 lbs.	6,601 lbs.

* Accurate figures as to the number of oxen, heifer, and sheep carcases inspected are not available. With five slaughter-houses to visit, it is impossible, as a routine, to inspect every carcase in detail. Every ox, heifer, or sheep carcase showing evidence of disease is, of course, thoroughly examined, and all carcases of bulls, cows, calves, and pigs are inspected.

Particulars are given below regarding the carcases seized wholly for diseases other than tuberculosis.

Disease.	Oxen.	Bulls.	Cows.	Heifers.	Calves.	Sheep.	Pigs.
Septic Pneumonia,	...	1	...	...	...	...	...
Septic Metritis,	...	...	3	...	...	...	...
Septic Mammitis,	..	...	8	.	...	5	...
Decomposition,	2	...	6	3	...	24	6
Extensive bruising,	2	...	2	1	...	4	...
Septic Pericarditis,	...	...	4	1	...	...	1
Johne's Disease,	...	...	1	...	...	...	...
Rickets,	..	...	...	..	...	...	19
Acute Swine Erysipela	...	...	...	...	...	...	2
Joint Ill,	...	..	...	.	2		...
Dropsy,	1	...	8	1	..	10	...
Fevered or badly bled,	1	...	13	1	2	4	6
Septic Peritonitis,	...	...	3	2	...	1	2
Jaundice,	..	...	2	...	..	...	1
Emaciation,	...	...	1	...	...	4	...
Septic Pleurisy,	...	...	1	...	...	...	1
Abnormal odour and various inflammatory conditions, &c., chiefly in emergency slaughter,	1	...	12	5	2	4	2
Total,	7	1	64	14	6	56	40

There are two large wholesale meat marts in Aberdeen to which carcases are consigned from County districts. As a routine all such carcases are inspected by the Meat Inspector in Aberdeen, and the following table gives the number of carcases and the weight of meat seized as unfit for human food in these marts:—

	Oxen.	Bulls.	Cows	Heifers.	Calves.	Sheep.	Pigs.
Number of carcases seized wholly—							
(1) For tuberculosis,	5	0	3	6	1	0	6
(2) For other diseases,	15	0	31	12	4	82	4
Number of carcases of which portions were seized—							
(1) For tuberculosis,	7	0	9	3	0	0	5
(2) For other diseases,	45	5	126	55	5	118	27
Total weight of meat seized,	10,628 lbs.	301 lbs.	24,195 lbs.	9,418 lbs.	588 lbs.	3,613 lbs.	1,919 lbs.

On page 175 will be found a table setting forth the total number of animals slaughtered and the number of carcases seized in whole or in part in the five slaughter-houses in Aberdeen during the year 1925, with comparative figures for 1924. In no case were legal proceedings necessary before diseased meat was destroyed.

Control of Other Foods.

In addition to the control of milk and milk food products, and of meat, the Health Department continues an extensive supervision of other foods. Thus, the Fish Market is visited daily, and the quantity of fish destroyed as unfit for human food in 1925 was 42,349 lbs., as compared with 59,554 lbs. in 1924. The sale of fruit and vegetables, both wholesale and retail, is also under extensive supervision. So also considerable attention continues to be paid to the inspection of tinned foods, and all factories where such articles are prepared are regularly visited. Provision curing yards, wholesale warehouses, and shops are also subject to routine visitation.

Table XVIII.—Aberdeen.—Seizures in Slaughter-houses.

Name of Slaughter-house.	Number of Animals Slaughtered.				A. Seizures for all Causes (including Tubercle). Number of Carcases Seized (Whole or Part).								B. Seizures for Tubercle only. Number of Carcases Seized (Whole or Part).							
	Cattle.	Calves.	Sheep.	Pigs.	Cattle.		Calves.		Sheep.		Pigs.		Cattle.		Calves.		Sheep.		Pigs.	
					Whole	Part.	Whole	Part.	Whole	Part	Whole	Part.	Whole	Part.	Whole	Part.	Whole	Part.	Whole	Part.
Hutcheon Street .	31,546	50	38,714	2,490	220	353	7	2	42	6	51	91	138	193	1	...	...	...	11	35
Charles Street .	1,728	...	2,558	5	9	33	...	...	2	...	...	...	7	11	...	...	...	...	...	...
Deer Road . .	4,883	...	3,888	4	22	103	...	...	1	1	...	...	22	43	...	...	...	...	...	...
Western Road .	1,996	2	2,651	10	4	29	...	...	10	...	...	...	3	18	...	...	...	...	...	...
Canal Place .	2,743	..	3,896	67	6	41	..	..	1	...	...	...	5	34	...	...	...	...	...	...
Totals for 1925 .	42,896	52	51,707	2,576	261	559	7	2	56	7	51	91	175	299	1	...	...	...	11	35
Corresponding Totals for 1924	43,710	60	47,571	3,314	230	682	8	4	40	30	43	117	157	388	1	1	...	...	17	83
Percentages of Seizures to Animals slaughtered in 1925					0·61	1·33	13·46	3·85	0·11	0·01	1·98	3·53	0·41	0·70	1·92	...	...	...	0·43	1·36
Corresponding Percentages for 1924 . . .					0·53	1·56	13·33	6·67	0·08	0·06	1·30	3·53	0·36	0·89	1·67	1·67	...	...	0·51	2·50

LABORATORY SERVICES.

The following statement gives in detail the number and results of examinations for the City of Aberdeen (including City Hospital) carried out in the City Hospital Laboratories during the year 1925:—

LABORATORY EXAMINATIONS FOR CITY OF ABERDEEN.

	Positive.	Negative.	Total.	Grand Total.
Diphtheria,	1,647	14,289	15,936	15,936
Tuberculosis—				
Sputum,	831	2,246	3,077	
Pus,	5	58	63	
Urines,	3	32	35	
Fæces,	3	22	25	
Cerebro-Spinal Fluids,	10	26	36	
				3,236
Typhoid—				
Widals,	9	122	131	
Blood Cultures	0	7	7	
Fæces,	25	194	219	
Urines,	10	140	150	
				507
Paratyphoid A and B—				
Widals,	37	225	262	
Blood Cultures,	5	25	30	
Fæces,	51	338	389	
Urines,	18	380	398	
				1,079
Bacillary Dysentery—				
Agglutinations,	2	13	15	
Fæces,	9	88	97	
				112
Food Poisoning—				
Fæces,	17	35	52	
Blood Cultures,	—	3	3	
Vomit,	2	4	6	
Agglutinations,	21	28	49	
Food Stuffs,	4	23	27	
Animal Specimens—				
Fæces,	1	95	96	
Agglutinations,	—	105	105	
Milks,	—	23	23	
				361
Venereal Diseases—				
Wassermann Tests,	95	389	484	
Gonococcal Examinations,	153	1,079	1,232	
Spirochete Examinations,	1	2	3	
				1,719
Epidemic Cerebro-Spinal Meningitis—				
Cerebro-Spinal Fluids,	6	2	8	8

General—

Urines for Bacteriological Examination,	133	
Urines for General Pathological Examination,	159	
Sputum for Organisms,	153	
Pus for Organisms,	138	
Fæces for Organisms,	13	
Fæces for Protozoal Examination,	15	
Throat and Nose Swabs for Organisms,	211	
Throat and Nose Swabs for S. Hæmolyticus,	230	
Ophthalmia Neonatorum,	45	
Cerebro-Spinal Fluids,	30	
Blood Cultures,	70	
Blood Counts,	11	
Fæces for Blood,	2	
Differential Cell Counts,	31	
Vaccines,	222	
Malaria,	14	
Hair for Ringworm,	2	
Miscellaneous,	5	
	——	1,484

Biochemical Estimation—

Blood Sugar,	23	
Urinary Sugar,	138	
Blood Urea,	3	
Urine Urea,	6	
Gastric Contents,	14	
Non-protein Nitrogen,	1	
	——	185

Water, Food, and Drug Samples—

Bacteriological Examination of Waters,	207	
Bacteriological Examination of Milks,	319	
All Samples analysed under the Sale of Food and Drugs Acts,	2,004	
	——	2,530

Animal Experiments—

Guinea-pigs inoculated with milk deposits for tubercle bacilli,	132	
Guinea-pigs inoculated with human material for tubercle bacilli,	5	
Guinea-pigs inoculated with milk, &c., for B. Gærtner and toxin,	7	
Guinea-pigs used for diphtheria virulence test,	2	
Guinea-pigs used for diphtheria toxin,	4	
Mice inoculated with material for B. Tetani,	4	
Mice used in typing pneumococci,	86	
Mice used for sodium ricinoleate mixture,	4	
Rabbit for Paul test,	1	
Rabbits used for sodium ricinoleate mixture,	2	
Hens fed on red squill,	4	
	——	251
		27,408

In addition to the above examinations for the City of Aberdeen, 1,776 examinations were carried out for the North-Eastern Counties within the Laboratory Services Scheme.

CHAPTER VI.

STATISTICAL COMMENTARY.

POPULATION.

The Registrar-General has now calculated the population of Aberdeen for each year since the 1921 census by adding the excess of births over deaths, and adding or subtracting the gain or loss of population due to immigration and emigration. Estimated in this manner, the population at the middle of each year, and including the inmates at Oldmill Hospital and Kingseat Mental Hospital chargeable to Aberdeen is as follows:—

Year.	Population.
1925	158,144
1924	157,764
1923	159,498
1922	160,308
1921	159,915

Prior to 1925, the method in use by the Registrar-General of estimating the population was based on the census population and the subsequent increase or decline was calculated from any change in the number of occupied houses, the number of such houses being obtained from the Assessor's Roll.

The population figure of 158,144 for 1925 has been used as a basis for calculating the various rates in this Report, and the rates for previous years have been subjected to the revision necessary to make them comparable with the rates for 1925.

The accompanying table gives the percentage and number of the population at each of the principal age-periods.

TABLE XIX.—ABERDEEN.—POPULATION AT VARIOUS AGE-PERIODS—1925.
(*As estimated from Proportions at Census of 1921.*)

		Under 1 year.	1 and under 5 years.	5 and under 15 years.	15 and under 25 years.	25 and under 45 years.	45 and under 65 years.	65 years and upwards.	ALL AGES.
Percentage of Population at each Age (according to Census)	1911	2·23	9·03	22·13	19·13	26·84	15·31	5·33	...
	1921	2·35	6·66	19·41	20·00	27·00	18·42	6·16	...
Estimated Population at each Age-Period in	1925	3,716	10,532	30,696	31,629	42,699	29,130	9,742	158,144

BIRTHS.

(Table XX.)

The total number of births during the year 1925, corrected for transfers, was 3,390, equivalent to a rate of 21·4 per 1,000 of the population, as against a rate of 21·8 per 1,000 in 1924. The average rate for the 1920-1924 quinquennium was 25·4.

Proportion of Males to Females.—The number of male infants to every 100 female infants, corrected for transfers, during 1925 was 101, as compared with 106 for 1924.

Illegitimate Births.—In 1925, the number of illegitimate births, after correction for transfers, was 252, and amounted to 7·4 per cent. of the total births. The average rate for the 1920-1924 quinquennium was 8·6.

Births in Proportion to Women of Child-bearing Ages (15-45 years).—When the births are compared with the number of women of fertile ages in the population, it is found that the number of legitimate births among married women in 1925 amounted to 183 per 1,000 of such women at the ages specified. In 1924, the rate was also 183.

Similarly stated, the illegitimate birth-rate among unmarried and widowed women of the fertile ages was 10·5 per 1,000 in 1925. In 1924, it was 10·2.

Still-Births.—The number of registered births, the number of still-births, and the still-birth rate per 1,000 of registered births, for the years 1920 to 1925 inclusive, were as follows:—

STILL-BIRTHS.

YEAR.	No. of Registered Births (including Oldmill).	No. of Still-births.	Rate per 1,000 Registered Births.
1925	3,545	136	38·4
1924	3,555	144	40·5
1923	3,863	159	41·2
1922	4,057	181	44·6
1921	4,336	189	43·6
1920	5,010	170	33·9
Mean of 1920-1924 . .	4,164	169	40·8

MARRIAGES.

(Tables XX., XXI., and XXII.)

During the year 1925, there were 1,519 marriages within the City, equivalent to a rate of 9·6 per 1,000 of the population, as against a rate of 9·2 in 1924. The average rate for the 1920-1924 quinquennium was 10·6.

The information contained in Table XXI., in regard to marriages during the years 1916-1925 inclusive, is compiled and calculated from the entries of the Registrars, and contains much interesting information relating to sex, status, occupation, and residence.

Residence.—In 1925, 1,020 of the males married were ordinarily resident in Aberdeen, the remaining 499 coming from outwith the City. As regards the females, 1,121 were ordinarily resident in the City, and 398 lived outside the City.

Status.—In the 1,519 marriages in 1925, the persons married included 133 widowers and 87 widows.

Occupations of Men.—Of the total marriages in 1925, 1,023 were of men belonging to the labouring and artisan classes, these classes forming by far the largest group of occupied males. In the commercial classes, there were 330 marriages, and in the professional classes, 164.

Occupations of Women.—Women employed in workshops and factories form the largest group of women engaged in known occupations, and as usual the greatest number of marriages took place among this class of workers in 1925, the number being 487. The next largest group was that of domestic servants, with 318 marriages. The third group was that of women without stated occupation, in which group there were 228 marriages. Next came saleswomen (including dealers), with 190 marriages; clerks and typists, with 135 marriages; teachers and nurses, with 94; and dressmakers and milliners, with 44.

Percentages of Marriages.—It must clearly be recognised, however, that the number of marriages in each occupation group gives no indication of the opportunity of marriage to men in different occupation groups, or of the chance of marriage belonging to women in the different groups. To measure the probability of marriage, it is necessary to measure the number of marriages against the total

TABLE XX.—ABERDEEN.—MARRIAGE, BIRTH, AND DEATH-RATES—1856 TO 1925.
Per 1,000 of population.

Year.	Population.	Marriages.		Births.†			Deaths.‡			Excess of Birth-Rate over Death-Rate.
		Number.	Rate per 1,000 of Population.	Number.	Rate per 1,000 of Population.	Illegit. Births per 100 Total Births.	Number.	Rate per 1,000 of Population.	Average Age at Death.	
1925	158,144	1,519	9·6	3,390	21·4	7·4	2,170	13·7	46·5	7·7
1924	157,764	1,459	9·2	3,437	21·8	7·2	2,302	14·6	44·7	7·2
1923	159,498	1,564	9·8	3,766	23·6	7·7	2,157	13·5	45·1	10·1
1922	160,308	1,616	10·1	3,969	24·8	9·7	2,595	16·2	41·5	8·6
1921	159,915	1,751	10·9	4,254	26·6	9·2	2,292	14·3	44·1	12·3
1920	160,466	2,122	13·2	4,868	30·3	9·3	2,398	14·9	40·1	15·4
Mean of 1920-1924	159,590	1,702	10·6	4,059	25·4	8·6	2,349	14·7	43·1	10·7
1919	161,017	2,235	13·9	3,379	21·0	10·6	2,469	15·3	43·4	5·7
1918	161,568	1,626	10·1	2,721	16·8	11·4	2,573	15·9	40·6	0·9
1917	162,119	1,341	8·3	2,880	17·8	11·8	2,387	14·7	41·2	3·1
1916	162,670	1,446	8·9	3,546	21·8	10·1	2,367	14·6	43·3	7·2
1915	163,222	1,878	11·5	3,784	23·2	10·0	3,075	18·8	36·3	4·4
Mean of 1915-1919	162,119	1,705	10·5	3,262	20·1	10·8	2,574	15·9	41·0	4·3
1916-1920	161,568	1,754	10·9	3,479	21·5	10·6	2,439	15·1	41·7	6·5
1911-1915	164,324	1,489	9·1	3,959	24·1	10·2	2,752	16·8	38·1	7.4
1906-1910	163,620	1,360	8·3	4,505	27·5	9·7	2,512	15·4	37·6	12·2
1901-1905	158,082	1,428	9·0	4,872	30·8	8·5	2,763	17·5	34·9	13·3
1896-1900	145,740	1,356	9·3	4,636	31·8	8·3	2,644	18·1	33·3	13·7
1891-1895	131,627	1,099	8·4	4,114	31·3	9·8	2,539	19·3	32·9	12·0
1886-1890	117,587	911	7·8	3,827	32·5	10·4	2,370	20·2	...	12·3
1881-1885	108,959	848	7·8	3,712	34·1	10·6	2,159	19·8	...	14·3
1876-1880	100,419	788	7·9	3,480	34·7	10 9	2,100	20·9	...	13·8
1871-1875	91,941	705	7·7	3,169	34·5	12·1	2,063	22·4	...	12·1
1866-1870	84,234	684	8·1	3,010	35·7	12·9	1,978	23·5	...	12·2
1861-1865	77,040	624	8·1	2,663	34·6	...	1,915	24·9	...	9·7
1856-1860	73,458	524	7·1	2,397	32·6	...	1,772	24·1	...	8·5

† Corrected for transferred births for 1911 and subsequent years.
‡ Corrected for transferred deaths for 1904 and subsequent years.

TABLE XXI.—ABERDEEN.—NUMBER OF MARRIAGES IN YEARS 1916-25.

	Year.									
	1925.	1924.	1923.	1922.	1921.	1920.	1919.	1918.	1917.	1916.
A.—MEN.										
Status :—										
BACHELORS, . . .	1386	1316	1426	1449	1605	1916	2043	1475	1208	1316
WIDOWERS, . . .	133	143	138	167	146	206	193	150	133	130
ALL, . . .	1519	1459	1564	1616	1751	2122	2236	1625	1341	1446
Occupation :—										
Labouring and Artisan, .	1023	1001	1113	1110	1260	1609	1637	1175	986	1090
Commercial, . . .	330	274	286	334	314	288	325	256	195	288
Professional, . . .	164	183	165	170	176	224	273	186	148	61
Other or No Occupation,	2	1	0	2	1	1	1	8	12	7
Residence :—										
In Aberdeen, . . .	1020	967	1073	1083	1190	1427	1411	1001	820	1046
Not in Aberdeen, . .	499	492	491	533	561	695	825	624	521	400
B.—WOMEN.										
Status :—										
SPINSTERS, . . .	1432	1361	1465	1498	1605	1931	2026	1480	1249	1340
WIDOWS, . . .	87	98	99	118	146	191	210	145	92	106
ALL, . . .	1519	1459	1564	1616	1751	2122	2236	1625	1341	1446
Occupation :—										
Domestic Servants, .	318	323	326	374	347	397	502	369	348	401
Dressmakers & Milliners,	44	49	61	79	118	108	112	115	95	83
Workers in other Work-shops and in Factories,	487	476	517	466	509	707	720	534	439	430
Saleswomen (incl. Dealers)	190	129	158	158	208	221	199	155	120	104
Clerks and Typists, .	135	115	139	121	133	127	122	101	71	73
Teachers and Nurses, .	94	96	77	100	99	102	92	76	75	87
Other Occupation, . .	23	33	38	30	19	35	43	45	21	23
No stated Occupation, .	228	238	248	288	318	425	446	230	172	245
Residence :—										
In Aberdeen, . . .	1121	1064	1201	1180	1348	1586	1721	1273	1061	1128
Not in Aberdeen, . .	398	395	363	436	403	536	515	352	280	318
IRREGULAR MARRIAGES.										
Number, ...	299	285	306	367	399	537	620	471	411	476
Percentage, . . .	19·7	19·5	19·6	22·7	22·8	25·3	27·7	29·0	30·6	32·9

number of men and women respectively belonging to each occupation group per 100 of such men and women. The following table indicates the relative percentages of marriages in the various groups:—

TABLE XXII.—ABERDEEN.—PERCENTAGE OF MARRIAGES OF PERSONS EMPLOYED IN DIFFERENT OCCUPATIONS.

A. MEN.

Occupation.	No. employed in Aberdeen (Census 1921).	No. of Marriages Registered in Aberdeen.					Percentage to No. employed.				
		1925	1924	1923	1922	1921	1925	1924	1923	1922	1921
(1) Labouring and Artisan,	36,661	1023	1001	1113	1110	1260	2·8	2·7	3·0	3·0	3·4
(2) Commercial, . .	8,522	330	274	286	334	314	3·9	3·2	3·4	3·9	3·7
(3) Professional, . .	4,516	164	183	165	170	176	3·6	4·1	3·6	3·8	3·9

B. WOMEN.

Occupation.	No. employed in Aberdeen (Census 1921).*	No. of Marriages Registered in Aberdeen.					Percentage to No. employed.				
		1925	1924	1923	1922	1921	1925	1924	1923	1922	1921
(1) Domestic Servants (including Waitresses and Laundry Workers)	4200	318	323	326	374	347	7·6	7·7	7·8	8·9	8·3
(2) Workers in Workshops and Factories (excluding Dressmakers, Milliners, and Laundry Workers), . .	7303	487	476	517	466	509	6·7	6·5	7·1	6·4	7·0
(3) Saleswomen (including Dealers), . . .	2710	190	129	158	158	208	7·0	4·8	5·8	5·8	7·7
(4) Teachers and Nurses, .	1797	94	96	77	100	99	5·2	5·3	4·3	5·6	5·6
(5) Clerks and Typists, .	3144	135	115	139	121	133	4·3	3·7	4·4	3·8	4·2
(6) Dressmakers and Milliners, ...	1613	44	49	61	79	118	2·7	3·0	3·8	4·9	7·3
(7) Other Occupations, .	2667	23	33	38	30	19	0·9	1·2	1·4	1·1	0·7
(8) No stated Occupation,	16,600	228	238	248	288	318	1·4	1·4	1·5	1·7	1·9

* Excluding Married Women.

Reference to the figures of the percentages of marriages of men employed in different occupations, as set forth in Table XXII., shows that the percentage of marriages in 1925 is greatest in the commercial classes.

As regards women, the chance of marriage would appear to be greatest among domestic servants, who provide the highest percentage of marriages.

The factors determining the chance of marriage in the various occupation groups are obviously very complex, but information concerning such factors as age distribution and social circumstances in the various occupation groups is too meagre to permit of detailed analysis.

DEATHS.

(Table XX.)

The total number of deaths during 1925, corrected for transfers, was 2,170, equivalent to a death-rate of 13·7 per 1,000 of the population. For the quinquennium, 1920-1924, the average annual number of deaths was 2,349, with a rate of 14·7.

The death-rate of 13·7 per 1,000 of population for 1925 was very slightly higher than the lowest Aberdeen death-rate yet recorded, namely 13·5 in 1923. In 1924, the death-rate was 14·6. At the commencement of civil registration, about 70 years ago, the death-rate in Aberdeen was about 24 to 25, so that the rate at the present time is slightly more than half of what it was in these earlier times.

The Average Age at Death of all persons dying during 1925 was 46·5 years. In the 1920-1924 quinquennium, it was 43·1 years.

Excess of Birth-Rate over Death-Rate.—In Table XX. will be found a column giving the excess of the birth-rate over the death-rate since the commencement of registration. The excess in 1925 was 7·7. For the quinquennium, 1920-1924, the excess was 10·7. The usual excess of birth-rate over death-rate for many years prior to 1911, was about 11 to 14.

Analysis of the Death-Rate.

Mortality in Relation to Age and Causes (Tables XV., XXIII., and XXIV.).

Infant Mortality.—This is dealt with in detail in the section of this Report relating to Maternity and Child Welfare Services.

Mortality at Pre-School Age-Period (1 to 5 years), excluding Infant Period (Tables XV., XXIII., and XXIV.).—The number of deaths at this age-period was 143, equivalent to a death-rate of 13·6 per 1,000 of the population at this age, as against 207 deaths in the preceding year, with an equivalent death-rate of 19·4. The average rate for the 1915-1924 decennium was 18·4. In the preceding year, the excessive mortality was wholly due to deaths from whooping-cough, measles, and tuberculous meningitis. In 1925, the deaths from whooping-cough still remained above the average for the preceding quinquennium, while the deaths from measles showed a definite decrease. The deaths from tuberculous meningitis were also lower than the average. Deaths from diseases of the digestive system, including diarrhœa, as also deaths from scarlet fever showed an increase as compared with the 1920-1924 quinquennium.

TABLE XXIII.—ABERDEEN.—MORTALITY FROM ALL CAUSES AT VARIOUS AGE-PERIODS *
(per 1,000 of population at each age).

Year.	Infantile Mortality.	Age Period.						All Ages.
	Deaths of Infants under 1 year per 1,000 Births.	0—5 years. (Pre-School Period.)	5—15 years. (School Period.)	15—25 years. (Adolescent Period.)	25—45 years. (Early Mature Period.)	45—65 years. (Late Mature Period.)	65 years and upwards. (Post-mature Period.)	
1925 . .	109	35·9	1·7	2·3	5·8	14·5	88·9	13·7
1924 . .	122	44·2	1·5	2·6	4·8	15·4	91·7	14·6
1923 . .	104	38·1	1·3	2·8	4·9	15·6	82·7	13·5
1922 . .	133	56·1	2·0	2·8	5·9	17·4	87·4	16·2
1921 . .	108	37·5	2·4	3·6	5·9	16·9	82·2	14·3
1920 . .	121	49·6	2·2	3·8	6·7	16·1	73·6	14·9
Mean of 1920-1924 (Five years).	118	45·2	1·9	3·1	5·6	16·3	83·5	14·7
1919 . .	118	36·6	3·2	4·4	6·7	17·2	91·7	15·3
1918 . .	143	41·9	3·6	5·4	7·8	17·3	83·8	15·9
1917 . .	139	41·6	2·9	3·2	6·2	17·5	80·6	14·7
1916 . .	112	35·1	2·8	3·4	6·4	18·9	84·1	14·6
1915 . .	173	62·5	4·5	4·1	7·0	21·3	91·8	18·8
Mean of 1915-1919 (Five years).	137	43·5	3·4	4·1	6·8	18·4	86·4	15·9
1916-1920 .	127	41·0	2·9	4·0	6·8	17·4	82·8	15·1
1911-1915 .	143	49·7	4·0	4·1	6·7	20·0	86·5	16·8
1906-1910 .	128	42·5	2·9	3·5	7·0	19·5	84·2	15·4
1901-1905 .	143	52·2	3·1	4·6	7·4	21·3	83·3	17·1
1896-1900 .	144	54·2	3·4	5·0	9·2	22·2	81·6	18·1
1891-1895 .	147	57·5	4·5	5·8	9·3	22·7	86·5	19·3
1886-1890 .	140	52·9	4·8	7·0	10·5	22·9	88·1	20·2
1881-1885 .	126	50·9	5·4	6·4	10·1	23·8	86·3	19·8
1876-1880 .	129	53·1	6·2	7·7	11·3	22·1	86·6	20·9
1871-1875 .	133	57·5	7·7	8·2	12·0	22·6	91·5	22·4
1866-1870 .	133	68·0	7·2	8·9	12·4	22·2	91·2	23·5
1861-1865 .	130	68·9	8·1	10·5	13·4	24·7	98·7	24·9
1856-1860 .	126	67·8	9·3	9·8	12·6	21·8	97·5	24·1

* Corrected for transferred deaths in 1904 and subsequent years.

TABLE XXIV.—ABERDEEN.—MORTALITY AT VARIOUS AGE-PERIODS FROM VARIOUS CAUSES.

(Corrected for transferred deaths.)

AGE.	ALL CAUSES.	Zymotic Diseases.			Tuber-culous Diseases.		Respiratory Diseases.			Diseases of Circulatory System	Diseases of Genito-Urinary System.	Nervous Diseases.			Dis. of Digest. Syst. incl. Diarrhœa.	Malignant Diseases.	Developmental Diseases (ex. old age)	Accident and Violence.	Debility, Atrophy, Inanition.		Miscellaneous.
		Ordinary.	Venereal.	Septic.	Respiratory.	Other Tuberculous	Pneumonia.	Bronchitis.	Other Respiratory.			Cereb. Haemo., Thrombosis, Embolism, & Hemip.	Convulsions	Other Nervous.					Under age of 1 year.	Above age of 65 years.	
A.—NUMBER OF DEATHS—YEAR 1925.																					
Under 1 year,	368	34	4	5	1	9	38	22	5	1	0	0	33	2	42	0	107	3	52	...	10
1—5 years,	143	65	0	0	0	13	19	4	0	0	1	0	5	2	15	0	4	12	...	...	3
5—15 ,,	52	17	0	1	2	9	2	0	1	0	0	0	0	5	4	0	2	6	...	...	3
15—25 ,,	74	2	0	0	33	5	2	0	1	4	1	0	0	1	4	2	0	10	...	...	9
25—45 ,,	246	3	2	4	74	4	6	1	3	23	13	7	0	16	15	23	0	25	...	...	27
45—65 ,,	421	4	1	4	35	2	18	16	4	70	27	56	0	25	23	90	0	21	...	...	25
65+ ,,	866	11	0	1	9	1	35	50	17	208	50	130	0	13	29	121	0	15	...	149	27
ALL AGES, .	2170	136	7	15	154	43	120	93	31	306	92	193	38	64	132	236	113	92	52	149	104
B.—DEATH-RATE PER 100,000 OF POPULATION AT EACH AGE—YEAR 1925.																					
Under 1 year,	9903	915	108	135	27	242	1022	592	135	27	0	0	888	54	1130	0	2879	81	1399	...	269
1—5 years,	1358	617	0	0	0	123	180	38	0	0	9	0	47	19	142	0	38	114	...	...	29
5—15 ,,	169	55	0	3	7	29	7	0	3	0	0	0	0	16	13	0	7	19	...	...	10
15—25 ,,	234	6	0	0	104	16	6	0	3	13	3	0	0	3	13	6	0	32	...	...	28
25—45 ,,	576	7	5	9	173	9	14	2	7	54	30	16	0	37	35	54	0	58	...	...	63
45—65 ,,	1445	13	3	13	120	6	61	55	14	243	93	192	0	86	79	309	0	72	...	...	86
65+ ,,	8889	113	0	10	92	10	359	513	175	2135	513	1334	0	133	298	1242	0	154	...	1529	277
ALL AGES, .	1372	86	4	9	97	27	76	59	20	193	58	122	24	40	83	149	71	58	...	...	66
C.—DEATH-RATE PER 100,000 OF POPULATION AT EACH AGE—AVERAGE FOR TEN YEARS—1915-1924.																					
Under 1 year,	12383	1244	329	46	64	204	1444	928	91	16	16	21	645	201	1295	5	3075	178	2248	...	334
1—5 years,	1844	773	3	5	44	220	309	58	15	5	12	3	64	47	103	6	12	111	...	...	54
5—15 ,,	264	71	0·3	1	21	41	24	2	2	16	8	1	1	17	20	1	2	19	...	...	17
15—25 ,,	360	41	0·3	2	112	23	24	2	4	29	8	1	0	24	21	7	1	26	...	...	35
25—45 ,,	622	61	3	5	162	11	46	9	6	57	34	13	0	40	31	45	0·4	40	...	...	60
45—65 ,,	1735	71	2	11	129	12	96	78	29	303	122	195	0	70	97	328	0	68	...	...	124
65+ ,,	8485	268	4	33	61	13	324	900	139	1833	454	1385	0	140	282	946	0	192	...	1219	292
ALL AGES, .	1529	153	9	7	101	39	114	97	20	188	63	122	20	48	88	129	73	55	...	...	78

Mortality at School Age-Period (5 to 15 years) (Tables XXIII. and XXIV).—The deaths at this age-period amounted to 52, or 1·7 per 1,000 of population at this age. As will be seen from Table XXIII., the mortality at this age-period continues at a low level, and the decline noted in recent years is being maintained. The lowering of mortality is particularly noticeable in the groups relating to tuberculosis and ordinary zymotic diseases.

Mortality at Adolescent Age-Period (15 to 25 years) (Tables XXIII. and XXIV).—The deaths at this age-period were 74, or 2·3 per 1,000 of the population, being the lowest death-rate recorded at this age-period since civil registration began. The average mortality-rate for the preceding ten years was 3·6 per 1,000 of the population. The lowering of this mortality is due to the diminution of the common zymotics and respiratory diseases.

Mortality at Early-Mature Age-Period (25 to 45 years) (Tables XXIII. and XXIV.).—The number of deaths at this age-period was 246, giving a rate of 5·8 per 1,000 of the population, which is slightly lower than the average for the preceding ten years (6·2). As in earlier age-periods, the decline in mortality is due to a diminished number of deaths from ordinary zymotics and respiratory diseases.

Mortality at Late-Mature Age-Period (45 to 65 years) (Tables XXIII. and XXIV.).—The deaths amounted to 421, with a rate of 14·5 per 1,000 of the population at this period, as compared with an average rate of 17·4 for the preceding decennium. The rate for 1925 is the lowest recorded since civil registration began.

Mortality at Post-Mature Age-Period (65 years and upwards) (Tables XXIII. and XXIV.).—The deaths amounted to 866, with an equivalent rate of 88·9 per 1,000 of the population, as compared with an average of 84·9 for the 1915-1924 decennium. By far the most common cause of death at this period was diseases of the circulatory system, accounting for about one-fourth of all the deaths; apoplexy and malignant disease were each responsible for about one-seventh of the deaths.

Mortality at All Ages (Tables XX., XXIII., and XXIV.).—The death-rate from all causes has already been referred to.

The percentage fall in the death-rate from the decade of 1861-1870 up to the end of 1925 is for each age-period as follows, namely:—48 for the pre-school (including the infant) period; 78 for the school period; 76 for the adolescent period; 55 for the early-mature period; 38 for the late-mature period; and 6 for the post-mature period.

During 1925, the diseases responsible for the largest number of deaths were as follows:—Diseases of circulatory system, 306 deaths; diseases of the nervous system, 295 deaths (including 193 due to cerebral hæmorrhage); malignant diseases, 236; respiratory diseases, 244; and tuberculosis, 197, of which 154 were respiratory.

Variations in Mortality from Selected Causes since 1856.

The variations in the mortality from selected causes at all ages since the year 1856—the second year of civil registration—can be conveniently followed in Table I.

Infectious Diseases.—These, including tuberculosis, are dealt with in greater detail in the part of the Report devoted especially to infectious diseases.

Cancer and other Malignant Diseases.—The cancer statistics for Aberdeen and for the other principal towns in Scotland were analysed in detail in the 1924 Report. The cancer death-rate was 149 per 100,000 of the population in 1925, as compared with a rate of 145 in 1924. During the 1920-1924 quinquennium, the average rate was 138.

Pneumonia.—The death-rate from pneumonia was 76 per 100,000 of the population, as against an average of 104 during the 1920-1924 quinquennium. The increased mortality from pneumonia in this quinquennium was due to an increased number of such deaths among children under five years of age.

Bronchitis, which has been an almost steadily declining cause of death since near the commencement of civil registration, gave a death-rate of 59 per 100,000 of the population, as compared with an average of 90 for the preceding quinquennium.

Diseases of the Digestive System.—In 1925, the death-rate from diseases of the digestive system was 83 per 100,000, as compared with a rate of 63 in 1924, which is the lowest yet recorded. The average for the 1920-1924 quinquennium was also 83 per 100,000.

Diseases of the Circulatory System.—The death-rate from these diseases was 193 per 100,000, being a rate similar to the average for the preceding quinquennium.

STATISTICAL DATA RELATIVE TO THE VARIOUS MUNICIPAL WARDS.

Table XXV. shows the birth-rate, infantile mortality, and death-rates in the various wards of the City during 1925. Three different types of wards are selected for comparison, namely:—(*a*) Rubislaw, giving data for a west-end population of the better class; (*b*) Torry, data for a working-class population living in modern tenements under good sanitary conditions; and (*c*) Greyfriars, a poor population living in somewhat dilapidated property.

The table shows that, in comparing Rubislaw and Torry from a health point of view, there is a balance in favour of Torry, particularly in respect of the much greater surplus of births over deaths. Greyfriars shows a distinctly worse record than Rubislaw and Torry, its death-rate being substantially higher. Nevertheless, the increased mortality in Greyfriars is offset by the fact that the excess of births over deaths in Greyfriars is notably higher than in either Torry or Rubislaw. All such comparisons, however, are unreliable in the absence of corrections for age and sex distribution of ward populations.

TABLE XXV.—ABERDEEN.—BIRTH-RATES AND DEATH-RATES FROM VARIOUS CAUSES.—*Year* 1925.

(Distributed according to Wards of City.)

	Whole City.	Ward of City.										
		Woodside.	St. Machar.	St. Andrew's.	St. Clement's.	Greyfriars.	St. Nicholas.	Rosemount.	Rubislaw.	Ruthrieston.	Ferryhill.	Torry.
Population (in thousands), Census 1921,	159·0	9·5	14·3	17·6	11·2	13·7	14·5	16·6	19·0	16·4	14·7	11·3
Birth-Rate, per 1,000 of Population,	21·4	19·8	19·3	24·8	32·1	37·0	25·2	18·1	10·3	14·8	16·3	24·9
Infantile Mortality, per 1,000 Births,	109	117	91	89	106	132	118	106	118	66	130	114
Death-Rate, per 100,000 of Population—All Causes,	1372	1474	1126	1284	1393	1824	1634	1403	1347	1085	1354	1186
Zymotic Diseases—												
Ordinary,	86	63	49	102	161	131	90	84	26	73	75	124
Venereal,	4	11	0	0	18	7	7	0	5	6	0	0
Septic,	9	0	7	6	0	22	34	6	21	0	0	0
Tuberculous Diseases—												
Respiratory,	97	95	70	114	80	131	103	102	74	92	116	88
Other Tuberculous,	27	31	28	11	27	51	7	36	26	30	27	27
Respiratory Diseases—												
Pneumonia,	76	42	56	91	125	190	69	54	100	18	34	53
Bronchitis,	59	53	42	57	71	73	83	90	63	24	68	9
Other Respiratory,	20	0	14	34	0	29	34	24	5	24	20	18
Diseases of Circulatory System,	193	158	147	176	152	175	221	205	258	183	245	150
Diseases of Genito-Urinary System,	58	53	63	74	45	73	69	48	84	55	34	18
Nervous Diseases—												
Cerebral Haemorrhage, &c.	122	200	98	97	53	110	124	169	200	98	102	62
Convulsions,	24	53	21	23	36	58	34	12	11	6	7	27
Other Nervous,	40	31	21	45	36	80	34	60	37	30	34	27
Diseases of Digestive System, including Diarrhœa,	83	95	70	45	107	124	91	103	68	37	109	97
Malignant Diseases,	149	126	98	148	134	161	175	175	132	159	190	124
Developmental Diseases (excluding old age),	71	84	76	74	125	95	98	54	26	24	75	97
Accidents and Violence,	58	42	28	62	80	80	91	36	32	61	34	115
Other Causes,	196	337	238	125	143	234	280	145	179	165	184	150

COMPARISON BETWEEN ABERDEEN AND OTHER TOWNS.

Two tables (XXVI. and XXVII.) are submitted, in which comparison is made between Aberdeen and other large towns in Scotland in regard to some of the more important features of their vital statistics.

The rates for births and deaths are corrected for transfers, that is, for births or deaths transferred from the records in the place of their occurrence to the records of the place of home residence.

A further correction is applied to the death-rate from all causes. This correction is necessary to a strict comparison between the towns, owing to the difference in sex and age distribution.

MARRIAGES.—Table XXVI. shows that, among the principal towns, Aberdeen occupied the highest place, with a rate of 97 per 10,000 of population. Edinburgh came second, with a marriage-rate of 96, and Glasgow third, with a rate of 85. Dundee, Paisley, and Greenock had marriage-rates of 76, 71, and 55 respectively.

As has been pointed out in previous Reports, the marriage-rate for the larger towns is inflated beyond its proper dimensions by the inclusion of a considerable number of marriages of people whose residence is beyond the City.

BIRTHS.—In respect of births, Aberdeen came fifth in the list, with a birth-rate of 216. The town with the highest birth-rate was Glasgow, with 246.

ILLEGITIMATE BIRTHS.—The percentage of illegitimate births in the total births was distinctly higher in Aberdeen than in any of the other principal towns, being 7·4, as against 6·4 in Dundee, 6·3 in Edinburgh, 5·9 in Glasgow, 5·7 in Greenock, and 4·5 in Paisley. Stated as births per 1,000 unmarried and widowed women of child-bearing ages (15-45 years), Greenock with 12·1 was the highest of the principal towns, Aberdeen coming next with 10·5, then Glasgow with 10·3, Dundee with 8·6, and Paisley was lowest with 6·5.

DEATHS.—As regards the crude death-rate from all causes and at all ages, Paisley had the lowest death-rate, with 132 per 10,000 of population, Aberdeen coming next, with a rate of 138. The rates in Greenock, Edinburgh, Glasgow, and Dundee were 143, 145, 148, and 167 respectively. When, however, this crude death-rate is corrected for age and sex distribution, Aberdeen had the lowest death-rate, 138; Glasgow, along with Dundee, had the highest rate of 167; and Greenock, Edinburgh, and Paisley had rates of 156, 147, and 145 respectively.

In regard to *Infantile Mortality* (deaths of infants under one year per 1,000 births), Aberdeen was second in the list, with a rate of 109, Dundee being emphatically the highest with a rate of 126. The towns with the lowest infant mortality were Edinburgh and Paisley, each with a rate of 96.

In respect of the death-rate for the *Principal Epidemic Diseases*, Aberdeen had the third lowest rate, 9·7 per 10,000 of population, Paisley and Greenock having rates of 7·3 and 9·0 respectively. Dundee had definitely the highest rate, 17·0.

TABLE XXVI.—BIRTH, DEATH, AND MARRIAGE RATES DURING THE YEAR 1925.

Six Principal Towns in Scotland.

(Corrected for transfers of births and deaths.)

	Glasgow.	Edinburgh.	Dundee.	Aberdeen.	Paisley.	Greenock.
ESTIMATED POPULATION, *(in thousands)*.	1034	422	169	157	86	81
MARRIAGE-RATE, *(per 10,000 of population)*.	85	96	76	97	71	55
BIRTH-RATE—						
A—Total Births, *(per 10,000 of population)*.	246	186	218	216	225	245
B—Legitimate Births, *(per 1,000 Married Women aged 15-45 years)*.	205	168	195	183	200	207
C—Illegitimate Births—						
(*a*) *Per 100 total Births*,	5·9	6·3	6·4	7·4	4·5	5·7
(*b*) *Per 1,000 Unmarried Women and Widows aged 15-45 years*,	10·3	7·2	8·6	10·5	6·5	12·1
DEATH-RATE—						
A—All Ages *(per 10,000 of population)*.						
(*a*) All Causes,	148	145	167	138	132	143
Corrected for Age and Sex Distribution,						
(*b*) Principal Epidemic Diseases,	11·4	11·8	17·0	9·7	7·3	9·0
(*c*) Tuberculosis—	167	147	167	138	145	156
(1) Respiratory,	9·7	9·5	8·7	9·7	10·2	8·5
(2) Other,	4·0	3·9	3·5	2·7	3·2	5·2
(*d*) Bronchitis,	11·2	7·9	11·6	5·9	8·7	9·6
(*e*) Pneumonia,	18·2	10·2	17·4	7·6	13·6	14·9
(*f*) Malignant Diseases,	14·3	16·0	17·5	15·0	12·0	10·6
(*g*) Diseases of Circulatory System,	16·0	20·3	24·4	19·4	16·4	28·2
(*h*) Nephritis and Bright's Disease,	4·3	4·3	3·7	3·8	4·9	3·9
(*i*) Diarrhœa and Enteritis (under 2 years),	2·7	1·8	2·3	2·3	2·1	3·6
(*j*) Violence (excl. Suicide),	5·3	5·0	5·1	4·9	3·7	3·7
B—Infants under One Year, *(per 1,000 births)*.	102	96	126	109	96	107
EXCESS of BIRTH-RATE over DEATH-RATE,	98	41	51	78	93	102

Table XXVII.—Diphtheria, Scarlet Fever, and Typhoid Fever in 1925 and preceding Five Years.

Four Principal Towns in Scotland.

City.		Estimated Population in Thousands	Total Number of Notified Cases.			Number of Notified Cases per 10,000 of Population.			Number of Deaths per 100 Notified Cases.			Percentage of Cases treated in Hospital.			Number of Deaths per 10,000 of Population.		
			Diphtheria.	Scarlet Fever.	Typhoid and Para-Typhoid Fever.	Diphtheria.	Scarlet Fever.	Typhoid & Para-Typhoid Fever.	Diphtheria.	Scarlet Fever.	Typhoid & Para-Typhoid Fever.	Diphtheria.	Scarlet Fever.	Typhoid & Para-Typhoid Fever.	Diphtheria.	Scarlet Fever.	Typhoid & Para-Typhoid Fever.
Aberdeen	1925	157	432	712	40	27	45	2·5	5·1	2·1	0·0	98	87	100	1·4	1·0	0·0
	Average 1920-24	*159*	*412*	*379*	*11*	*26*	*24*	*0·7*	*4·8*	*1·5*	*11·3*	*95*	*84*	*96*	*1·2*	*0·4*	*0·1*
Glasgow,	1925	1,034	1,736	3,812	44	17	37	0·4	6·7	1·8	29·3	97	96	95	1·1	0·7	0·1
	Average 1920-24	*1,039*	*1,846*	*3,502*	*126*	*18*	*34*	*1·2*	*7·7*	*1·9*	*12·4*	*96*	*95*	*93*	*1·4*	*0·6*	*0·2*
*Edinburgh,	1925	422	870	2,351	30	21	56	0·7	9·7	2·6	3·3	97	83	90	2·0	1·5	0·02
	Average 1921-24	*424*	*820*	*1,877*	*20*	*19*	*44*	*0·5*	*8·3*	*3·1*	*8·8*	*96*	*95*	*88*	*1·6*	*1·4*	*0·04*
Dundee,	1925	169	648	1,528	26	38	90	1·5	12·0	2·4	0·0	88	58	96	4·6	2·2	0·0
	Average 1920-24	*170*	*313*	*677*	*19*	*18*	*40*	*1·1*	*9·5*	*2·4*	*8·3*	*89*	*63*	*83*	*1·7*	*1·0*	*0·1*

* Leith added from 1921 onwards.

As regards the death-rate from *Tuberculosis of the Respiratory System*, Aberdeen, with 9·7, had the same rate as Glasgow; Paisley being higher with a rate of 10·2. From *Other Forms of Tuberculosis*, Aberdeen had the lowest death-rate, 2·7; Greenock having the highest with 5·2.

As to the death-rates from *Bronchitis* and *Pneumonia*, Aberdeen had lower rates than any of the other principal towns.

In respect of *Malignant Diseases*, Aberdeen had the third highest rate (15·0). Edinburgh and Dundee had rates of 16·0 and 17·5 respectively. It has been shown, however, in an analysis of the cancer death-rates submitted in the 1924 Annual Report that the apparently higher mortality from cancer in the east coast towns as compared with the west coast towns is unreal and disappears when the populations of the various towns are standardised.

As to the death-rate from *Diseases of the Circulatory System*, Aberdeen, with 19·4, was third lowest, Glasgow and Paisley having rates of 16·0 and 16·4 respectively.

As to *Nephritis and Bright's Disease of the Kidney*, Aberdeen had the second lowest rate (3·8), Dundee being slightly lower with a rate of 3·7. The rate was highest in Paisley with 4·9.

As regards the death-rate from *Diarrhœa and Enteritis* in children under two years, Aberdeen and Dundee had similar rates, namely, 2·3. The rate was highest in Greenock with 3·6.

In respect of deaths from *Violence (excluding Suicide)*, Aberdeen had a death-rate of 4·9. The rate was highest in Glasgow with 5·3.

Excess of Birth-Rate over Death-Rate.—As in the preceding year, the excess was highest in Greenock with 102 per 10,000 of population, and lowest in Edinburgh with 41. In Aberdeen, it was 78.

Zymotic Prevalence.—In Table XXVII. a comparison is made between the four chief towns in respect of (*a*) the number of notified cases of three zymotic diseases, namely, diphtheria, scarlet fever, and typhoid and paratyphoid fever; (*b*) the percentage of deaths among such cases; (*c*) the percentage of cases removed to hospital for treatment; and (*d*) the number of deaths from these diseases per 10,000 of population.

In regard to *Diphtheria*, it will be observed that Dundee, judged by the number of notified cases, had by far the highest prevalence, the rate being 38 per 10,000 of population, as compared with 27 for Aberdeen, 21 for Edinburgh, and 17 for Glasgow. The percentage of deaths was lowest in Aberdeen. The percentage of cases removed to hospital in Aberdeen (98) was slightly higher than in the other three towns.

Scarlet Fever showed an increase in prevalence in all the four towns in 1925, as compared with the preceding quinquennium. Dundee had the highest prevalence, the notified cases per 10,000 of population being 90, as against 56, 45, and 37

respectively, in Edinburgh, Aberdeen, and Glasgow. Glasgow had the lowest case-mortality (1·8), Aberdeen having a rate of 2·1. In Aberdeen, 87 per cent. of the cases were removed to hospital for treatment.

As regards *Typhoid and Paratyphoid Fever*, Aberdeen had the highest prevalence, the rate being 2·5 cases per 10,000 of population. This high prevalence in Aberdeen was due to an outbreak of paratyphoid fever caused by infected ice-cream. Aberdeen and Dundee had no deaths from these diseases in 1925. In Aberdeen, all the cases were treated in hospital, as against 95, 90, and 96 per cent. respectively, in Glasgow, Edinburgh, and Dundee.

No attempt has been made to elaborate the statistics set out in this section of the Report. Without corrections for age and sex and standardisation, a comparison of disease-rates and death-rates in the various towns is futile. Even when so standardised, a false value is attached to such a comparison, since it ignores natural variation in the local prevalence of disease, and tends to suggest that disease prevalence is dependent on immediate environmental conditions to an extent that is not warranted by existing knowledge.

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