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## CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES[1]

**April 21–May 18, 1935**

The prevalence of certain important communicable diseases, as indicated by weekly telegraphic reports from State health departments to the United States Public Health Service, is summarized in this report. The underlying statistical data are published weekly in the Public Health Reports, under the section entitled "Prevalence of Disease."

*Meningococcus meningitis.*—For the 4 weeks ended May 18 there were 705 cases of meningococcus meningitis, as compared with 659 for the preceding 4 weeks. The increase during the current period was contrary to the usual seasonal expectancy of this disease; in practically every year for which data are available (1913–34), the seasonal peak came in March or April and during the period corresponding to that under report a steady decline was in progress.

In the South Central and Mountain and Pacific sections the disease decreased according to the seasonal expectancy, but in the North Atlantic, North Central, and South Atlantic regions increases in the incidence were reported. In New York the number of cases rose from 83 for the 4 weeks ended April 27 to 104 for the current period; in Missouri, from 33 to 52; in Virginia, from 29 to 46; in Maryland, from 24 to 39; in West Virginia, from 7 to 21. In Texas the number of reported cases dropped from 16 to 4, and in Oklahoma from 23 to 7.

For the entire reporting area the current incidence was more than 3 times that for the corresponding period in each of the 2 preceding years. The number of cases was the highest for this 4-week period since 1930, when 806 cases were reported; and this is true for each geographic area except the South Central. In the South Atlantic section the number of cases (150) was more than 7 times that for the corresponding period last year, while the increases in other regions ranged from 2 to nearly 4 times last year's figures.

[1] From the Office of Statistical Investigations, U. S. Public Health Service. The numbers of States included for the various diseases are as follows: Typhoid fever, 48; poliomyelitis, 48; meningococcus meningitis, 48; smallpox, 48; measles, 47; diphtheria, 48; scarlet fever, 48; influenza, 44 States and New York City. The District of Columbia is counted as a State in these reports. These summaries include only the 8 important communicable diseases for which the Public Health Service receives regular weekly reports from the State health officers.

The table shows by geographic areas the number of cases reported during 1934–35 in comparison with corresponding periods in the 3 preceding years.

The table indicates a decrease in the number of cases for the week ended May 25 from the weeks included in the current 4-week period.

*Meningococcus meningitis cases reported in each geographic area during 1934–35 with comparative data for corresponding periods in the 3 preceding years* [1]

| Year | 4-week period ended— | | | | Week ended— | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec. 29 | Jan. 26 | Feb. 23 | Mar. 23 | Mar. 30 | Apr. 6 | Apr. 13 | Apr. 20 | Apr. 27 | May 4 | May 11 | May 18 | May 25 |
| Total: [2] | | | | | | | | | | | | | |
| 1934–35 | 202 | 307 | 525 | 646 | 173 | 174 | 158 | 154 | 174 | 175 | 177 | 179 | 152 |
| 1933–34 | 172 | 210 | 227 | 225 | 64 | 63 | 58 | 64 | 52 | 72 | 52 | 44 | 64 |
| 1932–33 | 241 | 362 | 307 | 393 | 89 | 95 | 75 | 81 | 68 | 52 | 63 | 47 | 57 |
| 1931–32 | 280 | 314 | 327 | 296 | 112 | 69 | 94 | 74 | 69 | 73 | 70 | 65 | 47 |
| New England and Middle Atlantic: | | | | | | | | | | | | | |
| 1934–35 | 44 | 42 | 52 | 111 | 32 | 35 | 22 | 38 | 39 | 43 | 32 | 41 | 29 |
| 1933–34 | 38 | 38 | 40 | 42 | 8 | 11 | 9 | 8 | 12 | 13 | 8 | 8 | 15 |
| 1932–33 | 43 | 58 | 58 | 63 | 15 | 17 | 24 | 16 | 8 | 9 | 13 | 9 | 17 |
| 1931–32 | 71 | 91 | 83 | 70 | 33 | 20 | 24 | 25 | 18 | 14 | 19 | 23 | 11 |
| East North Central: | | | | | | | | | | | | | |
| 1934–35 | 44 | 79 | 120 | 149 | 49 | 50 | 46 | 44 | 56 | 45 | 53 | 41 | 42 |
| 1933–34 | 45 | 60 | 58 | 58 | 27 | 21 | 11 | 24 | 10 | 22 | 13 | 14 | 16 |
| 1932–33 | 81 | 115 | 86 | 137 | 32 | 36 | 17 | 30 | 29 | 16 | 22 | 22 | 21 |
| 1931–32 | 85 | 105 | 89 | 96 | 41 | 13 | 38 | 21 | 15 | 25 | 19 | 16 | 8 |
| West North Central: | | | | | | | | | | | | | |
| 1934–35 | 27 | 33 | 81 | 90 | 22 | 22 | 16 | 15 | 17 | 25 | 16 | 25 | 16 |
| 1933–34 | 18 | 16 | 31 | 26 | 12 | 8 | 11 | 4 | 12 | 7 | 8 | 7 | 11 |
| 1932–33 | 30 | 53 | 39 | 63 | 10 | 12 | 6 | 12 | 10 | 8 | 10 | 6 | 5 |
| 1931–32 | 25 | 23 | 39 | 27 | 10 | 5 | 8 | 3 | 6 | 4 | 6 | 9 | 4 |
| South Atlantic: | | | | | | | | | | | | | |
| 1934–35 | 25 | 54 | 93 | 121 | 30 | 32 | 25 | 21 | 21 | 36 | 45 | 48 | 27 |
| 1933–34 | 33 | 25 | 24 | 29 | 10 | 6 | 11 | 14 | 2 | 9 | 6 | 4 | 4 |
| 1932–33 | 26 | 41 | 43 | 26 | 8 | 6 | 9 | 7 | 9 | 5 | 2 | 1 | 5 |
| 1931–32 | 24 | 32 | 29 | 34 | 10 | 18 | 8 | 6 | 8 | 10 | 7 | 7 | 7 |
| East and West South Central: | | | | | | | | | | | | | |
| 1934–35 | 35 | 67 | 124 | 114 | 28 | 15 | 33 | 25 | 24 | 12 | 18 | 14 | 19 |
| 1933–34 | 19 | 48 | 47 | 51 | 4 | 11 | 12 | 8 | 10 | 20 | 12 | 9 | 12 |
| 1932–33 | 34 | 63 | 56 | 60 | 14 | 17 | 16 | 9 | 7 | 9 | 13 | 6 | 3 |
| 1931–32 | 41 | 33 | 53 | 30 | 9 | 8 | 13 | 13 | 12 | 6 | 12 | 5 | 11 |
| Mountain and Pacific: [2] | | | | | | | | | | | | | |
| 1934–35 | 27 | 32 | 55 | 61 | 12 | 20 | 16 | 11 | 17 | 14 | 13 | 10 | 19 |
| 1933–34 | 19 | 23 | 27 | 19 | 3 | 6 | 4 | 6 | 6 | 1 | 5 | 2 | 6 |
| 1932–33 | 27 | 27 | 25 | 44 | 10 | 7 | 3 | 7 | 5 | 5 | 3 | 3 | 6 |
| 1931–32 | 34 | 30 | 34 | 39 | 9 | 5 | 3 | 6 | 10 | 14 | 7 | 5 | 6 |

[1] See the Public Health Reports for the issue of May 10, p. 634, for data in 4-week periods for 4 full years, and Apr. 12, 1935, p. 504, for weekly data from Dec. 2, 1934, to Mar. 30, 1935, and corresponding weeks of preceding years.

[2] Exclusive of Nevada.

*Poliomyelitis.*—The incidence of poliomyelitis (92 cases) increased about 15 percent during the current period over the preceding period. Certain States, however, seemed mostly responsible for the increase. California reported 16 cases, Louisiana 9, North Carolina 7, Washington 6, Virginia and Oklahoma 5 each, while no more than 3 cases were reported from any other State. The current incidence for the country as a whole stood at about the average for recent years, excepting 1934, when an epidemic was in progress at this time in California.

*Typhoid fever.*—The number of cases (629) of typhoid fever reported for the 4 weeks ended May 18 was the lowest for the corresponding period in recent years. The decreases from last year's figures ranged

from 10 percent in the South Central regions to more than 50 percent in the North Atlantic sections.

*Scarlet fever.*—During the 4 weeks ended May 18 scarlet fever continued to increase; the incidence rose in Minnesota from 1,131 cases for the 4 weeks ended April 20 to 1,568 for the current period, in North Dakota from 276 to 309, in Nebraska from 174 to 276, and in Utah from 430 to 504. Other States, including Illinois, Wisconsin, Colorado, and the District of Columbia (where the disease has been unusually prevalent), reported significant decreases. For the entire reporting area the number of cases was 27,821, the highest incidence for this period in recent years. Each geographic area except the South Central sections reported more cases than last year. In the South Central regions the current incidence was the lowest in recent years, no State in those areas reporting an unusual prevalence.

*Diphtheria.*—The total number of cases of diphtheria reported for the 4 weeks ended May 18 was 2,044, as compared with 2,190 and 2,033 for the corresponding period in 1934 and 1933, respectively. For the current period the East North Central States reported a 30-percent increase over last year's figure and the South Atlantic group reported approximately the same incidence, but in other sections the number of cases fell considerably below that for the corresponding period last year.

*Smallpox.*—The number of cases of smallpox reported for the current period was 710, of which number Washington State reported 148, Nebraska 115, Kansas 85, Wisconsin 67, California 54, Montana 40, Wyoming 30, and South Dakota and Oregon 24 each. Other States reported only a normal incidence. In Texas the number of cases dropped from 139 for the preceding 4 weeks to 18 for the current period. For the country as a whole the number of cases represented an increase of about 10 percent over the figures for this period in 1934 and 1933, but it was only about 50 percent of the number reported in 1932.

*Influenza.*—The incidence of influenza continued to decline in all sections of the country. For the 4 weeks ended May 18 the cases totaled 3,300, which was about 85 percent of last year's figure for the corresponding period. While the number of cases in the North Central section was not high, the incidence there has been slightly above the seasonal expectancy. Other areas reported a normal incidence.

*Measles.*—The number of cases of measles (123,291) reported for the 4 weeks ended May 18 represented a decrease of approximately 20,000 from the number reported for the preceding 4 weeks. In comparison with preceding years the incidence was still high, almost reaching the level of last year, when the disease was exceptionally prevalent. Apparently the crest of the current wave was passed during the 4 weeks ended April 27, while in the 6 preceding years it

was not reached until the period corresponding to the one now under consideration. The highest incidence in 1926, another year in which measles was unusually prevalent, was reached during the same 4-week period, with approximately 95,000 cases reported. In the New England and Pacific regions the current incidence was the highest for this year, but in all other areas declines were reported. Regions in which the disease has been most prevalent reported very significant increases over last year's figures, but in the South Atlantic and South Central areas the current incidence was very low in comparison with that of last year, when the incidence was high in those sections.

*Deaths, all causes.*—The average death rate from all causes in large cities, as reported by the Bureau of the Census, for the 4 weeks ended May 18 was 12.1 per 1,000 inhabitants (annual basis). The rates for the corresponding periods in the 4 preceding years were 11.8, 11, 11.6, and 11.9, regressively. The current rate was the highest since 1930, when the rate for this period was 12.5. The cause of the increase is not directly apparent, unless it is the result of the unusual prevalence of meningitis, measles, and scarlet fever.

## PROTECTION OF MICE AGAINST MENINGOCOCCUS INFECTION BY POLYVALENT ANTIMENINGOCOCCIC SERUM

By SARA E. BRANHAM, *Senior Bacteriologist, National Institute of Health, United States Public Health Service*

Several years ago we reported the production of meningococcus meningitis in rabbits (*1*) and in guinea pigs (*2*) by intracisternal injection of suspensions of virulent meningococci. Some studies were also made with mice; but at that time these animals seemed less interesting, because of the relatively much larger number of bacteria required to infect them. As a rule it was necessary to give a 20 gm mouse, intraperitoneally, at least 5 to 10 times the dose for a 250 gm guinea pig, intracisternally.

Within the last 2 or 3 years really virulent cultures of meningococci have been hard to obtain. The fact that a strain has been immediately isolated from a human case does not mean that it is virulent enough to produce an infection in a rabbit, a guinea pig, or a mouse. About a year ago we received from the Municipal Contagious Disease Hospital in Chicago two strains (524, group I, and 527, group II) which infected mice readily, and our studies with these animals were resumed.

It is well known that virulence is quickly and easily lost in meningococci. Mouse passage proved unreliable as a means of maintaining it; and suitable samples of mucin, for use as described by Miller (*3*), were unavailable at that time. We succeeded in maintaining the

virulence of these two strains for several months, especially strain 527 (II), by cultivating them upon Murray's (*4*) EDB/V medium and storing these cultures at −15° C., according to the method used by Pabst (*5*).

During the winter of 1934–35 there was a sharp increase in incidence of meningococcus meningitis in a number of localities. The city of Baltimore had an unusual number of cases; and through the generous cooperation of Dr. Ewing and Mr. Albaugh, of the laboratories of that city, and from the Johns Hopkins University we have been supplied with strains of high virulence.

Most of these strains belonged to the I–III group, though a few were of group II. In this report certain strains are designated as I or as III. The author has previously expressed the view (*6*) that such strains do not represent two clear-cut groups, and that the designation "I–III" is more nearly correct. This view was expressed by Griffith and by Scott a number of years ago (*7*). However, some strains are more markedly agglutinated by group I serum and others by group III. In this paper we are designating such strains as I or III, as the case may be, and are using the term "I–III" for those strains agglutinated equally by serums representing both groups.

The virulence of our strains for mice was titrated as follows: 18-hour cultures on 5 percent rabbits' blood agar or EDB/V agar slants were suspended in Ringer's solution of pH 7.0. These suspensions were diluted in Ringer's solution until they corresponded in turbidity to silica suspensions of 100 parts per million to 500 parts per million (*8*). Five-tenths cubic centimeter of each dilution was injected into each of three mice intraperitoneally.

The course of the infection in our mice was essentially as described by Miller (*9*), and it is unnecessary to repeat the details here except to note that, in addition to those symptoms observed by him, some of our mice showed definite nervous symptoms, especially convulsions. The majority of the mice died within 24 hours, usually within 6 to 18 hours. There seemed little to be gained by observing them longer than 48 hours. Throughout all of these studies most of our mice were autopsied, a Gram-stained smear was made from the omentum, and a rabbits' blood agar culture was made from the heart blood. Histological examination of the brains of these animals did not reveal any definite meningeal involvement, but merely a hyperemia.

As a rule we discarded all strains which did not kill all mice in a suspension of a density corresponding to 100 parts per million of silica—approximately 100,000 meningococci. This seems to be a large number of bacteria to inject, but actually it is much smaller than any heretofore reported with meningococci in animals, with the exception of the recent reports of Miller (*10*) and of Rake (*11*).

The object in studying meningococcus infection in mice was to find a successful method of evaluating therapeutic antimeningococcic serums. Thus, as soon as practicable, a study of the protective action of such serums was begun. These protection experiments were done with the following 10 strains:

| Strain no. | Group | Strain no. | Group |
|---|---|---|---|
| 524 | I | 535 | I |
| 527 | II | 536 | I |
| 528 | III | 541 | I-III |
| 530 | III | 544 | III |
| 534 | III | 562 | I-III |

Suspensions of a density corresponding to 100 parts per million of silica were given intraperitoneally in 0.5 cc amounts per 20 gm mouse. This constituted our standard dose. Since meningococci autolyze quickly in suspension, no suspensions more than a half hour old were used, but fresh ones were made up and control mice injected with each lot. The mortality with these different lots sometimes varied tremendously.

The mice used came from many sources, and the usual variations in conditions and resistance were to be expected. Since no pure breeds of mice were available, it was considered desirable to use a relatively large number of animals. In our experiments either 15 or 20 mice were used for each serum, or serum dilution, and the same number for controls. The mice were kept in large glass jars, 5 mice in each jar.

We have studied 33 polyvalent therapeutic serums, representing 8 manufacturers, 9 samples of normal horse serum from 6 manufacturers, and 7 samples of serum from individual normal horses outside of laboratories. The polyvalent immune serums included 5 antitoxins which at the time were being made for experimental purposes only. These will be designated by (a).

During the earlier experiments the serums were given within one-half hour preceding the injection of meningococci. At first the serums were given intravenously and intraperitoneally to parallel series of mice, 0.5 cc of undiluted serum being used. Table 1 shows the results obtained with 5 polyvalent therapeutic serums with 4 strains of meningococci when given by these two routes. All seemed to show some degree of protection, but serums D, B, and A, all new, were better than E, which was at least 5 years old. There was no consistent difference in the amount of protection afforded by these two routes, as was also found by Miller (*12*), and so subsequently the intraperitoneal route was used.

TABLE 1.—*Comparison of intraperitoneal and intravenous routes of administration of polyvalent antimeningococcic serums to mice within 1/8 hour prior to intraperitoneal injection of culture*

| Experiment no. | Serum | Method used | Strain | Mortality [1] | Agglutinin titer of serum with "type strains" [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *Percent* | (I) | (II) | (III) | (IV) |
| 1 | A | Intraperitoneal | 524 (I) | 10 | 444321 | 444443 | 443211 | 443211 |
| | A | Intravenous | 524 (I) | 10 | | | | |
| | B | Intraperitoneal | 524 (I) | 10 | 334444 | 344443 | 344432 | 244432 |
| | B | Intravenous | 524 (I) | 10 | | | | |
| | No serum | | 524 (I) | 70 | | | | |
| 2 | C | Intraperitoneal | 527 (II) | 30 | 444311 | 444443 | 433211 | 443211 |
| | C | Intravenous | 527 (II) | 25 | | | | |
| | D | Intraperitoneal | 527 (II) | 10 | 443211 | 444444 | 444443 | 444311 |
| | D | Intravenous | 527 (II) | 40 | | | | |
| | No serum | | 527 (II) | 83 | | | | |
| 3 | E | Intraperitoneal | 527 (II) | 80 | 222110 | 444310 | 331000 | 443100 |
| | E | Intravenous | 527 (II) | 80 | | | | |
| | No serum | | 527 (II) | 100 | | | | |
| | E | Intraperitoneally | 528 (III) | 10 | | | | |
| | E | Intravenous | 528 (III) | 0 | | | | |
| | No serum | | 528 (III) | 30 | | | | |
| | E | Intraperitoneal | 524 (I) | 20 | | | | |
| | E | Intravenous | 524 (I) | 10 | | | | |
| | No serum | | 524 (I) | 40 | | | | |
| | E | Intraperitoneal | 530 (III) | 20 | | | | |
| | E | Intravenous | 530 (III) | 40 | | | | |
| | No serum | | 530 (III) | 40 | | | | |

[1] Each percentage represents 20 mice. ½ cc of undiluted serum preceded 0.5 cc of standard suspension of meningococci.

[2] 4=complete agglutination; 3, 2, and 1=varying degrees of agglutination; 0=no agglutination. 6 serum dilutions from 1:100 to 1:3200.

Following these preliminary experiments, 13 polyvalent serums and 9 normal horse serums were tested for protection of mice against strain 527 (II). As before, 0.5 cc of the serums was given intraperitoneally within one-half hour preceding the injection of meningococci. Table 2 shows the results of these experiments. It can be seen that some of the normal horse serums protected quite as well as, and even better than, some of the polyvalent serums, such as normal A, normal K, and normal O; but, on the other hand, certain of the polyvalent serums afforded very high, and even complete, protection, as, F, I, L, and N. Although 2 of these normal serums were from horses whose history was unknown to us, the other 7 (including the 1 which gave best protection) came from individual horses in our own locality, and it is certain that they had never been given any kind of immunization.

TABLE 2.—*Protection afforded mice by normal and by immune polyvalent serums against infection with a group II strain of meningococcus*

| Experiment no. | Serum | Method used | Strain | Mortality[1] | Agglutinin titer of serums with "type strains" | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | I | II | III | IV |
| | | | | *Percent* | | | | |
| 4 | F | Intraperitoneal | 527 (II) | 0 | 444321 | 444443 | 443211 | 443211 |
| | G (a) | do | do | 15 | 444432 | 311100 | 110000 | 000000 |
| | D | do | do | 10 | 443211 | 444444 | 444443 | 444311 |
| | H (a) | do | do | 35 | 444332 | 111100 | 111100 | 000000 |
| | No serum | | do | 80 | | | | |
| 5 | I | Intraperitoneal | 527 (II) | 0 | 333221 | 444443 | 322111 | 444321 |
| | H (a) | do | do | 27 | 444332 | 111100 | 111100 | 000000 |
| | J | do | do | 20 | 100000 | 444310 | 331100 | 443100 |
| | K (a) | do | do | 13 | 444433 | 000000 | 000000 | 000000 |
| | Normal A | do | do | 10 | 00 | 00 | 00 | 00 |
| | Normal K | do | do | 10 | 00 | 00 | 00 | 00 |
| | No serum | | do | 70 | | | | |
| 6 | Normal D | Intraperitoneal | 527 (II) | 33 | 00 | 00 | 00 | 00 |
| | Normal L | do | do | 20 | 00 | 00 | 00 | 00 |
| | No serum | | do | 55 | 00 | 00 | 00 | 00 |
| 7 | Normal M | Intraperitoneal | 527 (II) | 40 | 00 | 00 | 00 | 00 |
| | Normal N | do | do | 40 | 00 | 00 | 00 | 00 |
| | Normal O | do | do | 13 | 00 | 00 | 00 | 00 |
| | Normal P | do | do | 40 | 00 | 00 | 00 | 00 |
| | L | do | do | 6 | 223321 | 444443 | 343322 | 444421 |
| | M | do | do | 40 | 334432 | 444443 | 344433 | 444443 |
| | No serum | | do | 80 | | | | |
| 8 | N | Intraperitoneal | 527 (II) | 0 | 333210 | 444432 | 444421 | 444200 |
| | O | do | do | 33 | 444443 | 444443 | 444331 | 444310 |
| | M | do | do | 28 | 334432 | 444443 | 344433 | 444443 |
| | Normal (pool) | do | do | 13 | 00 | 00 | 00 | 00 |
| | No serum | | do | 75 | | | | |

[1] Each percentage represents 20 mice.

That the preservatives in the serums had no role in the protection was clearly shown by injecting series of mice with 1 cc of 0.3 percent phenol, 0.3 tricresol, and 1/10,000 merthiolate, the 3 preservatives most commonly used in serums. These mice succumbed to infection as rapidly and in as high a percentage as did the control mice that were given only meningococci in Ringer's solution. The normal horse serums obtained by us locally contained no preservative.

The effect of the length of the interval between the serum and infecting dose was next studied. Five polyvalent serums and one normal horse serum were given to different series of mice 1 hour, 4 hours, 8 hours, 12 hours, and 24 hours before the injection of the culture suspension. Here a difference between the immune and normal serums was more apparent. The results can be seen in table 3. With the polyvalent serums the best protection seems, on the whole, to have been obtained by giving the serum injection 4 hours before the infecting dose. Some of the serums protected well even when given 24 hours before the organisms, as in N; but with others there was practically no protection demonstrable in that interval, as in G (a). The protection afforded by the normal horse serum, normal Q, was the greatest within 1 hour after injection and had practically disappeared after 24 hours.

TABLE 3.—*The effect of the interval between intraperitoneal injections of serum and of culture on protection of mice by antimeningococcic serums*

| Experiment no. | Strain | Serum | Mortality according to interval between serum and infecting dose [1] | | | | | Agglutinin titer of serum with "type strains" | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 hr. | 4 hrs. | 8 hrs. | 12 hrs. | 24 hrs. | I | II | III | IV |
| | | | Pct. | Pct. | Pct. | Pct. | Pct. | | | | |
| 9 | 527 (II) | N | 6 | 0 | ------ | ------ | 12 | 333210 | 444432 | 444421 | 444200 |
| | | L | 33 | 27 | ------ | ------ | 48 | 444443 | 444443 | 444331 | 444310 |
| | | No serum | 60 | 70 | ------ | ------ | 80 | | | | |
| 10 | 527 (II) | P | 47 | 47 | 47 | 53 | 20 | 444432 | 444432 | 444320 | 444310 |
| | | G (a) | 60 | 33 | 66 | 53 | 47 | 444432 | 311100 | 110000 | 000000 |
| | | No serum | 100 | 100 | 80 | 80 | 40 | | | | |
| 11 | 527 (II) | Q | 26 | 13 | 26 | 26 | 26 | 444444 | 444421 | 444211 | 444311 |
| | | Normal Q | 6.6 | 30 | 26 | 33 | 50 | 00 | 00 | 00 | 00 |
| | | No serum | 40 | 60 | 40 | 20 | 60 | | | | |

[1] Each percentage represents 15 mice.

The data shown in table 3 led us to use the 4-hour interval between serum and infecting dose in our next series of experiments. In this way we hoped to get the maximum protection from the immune serums and to avoid the period of greatest protective action of horse serum in itself.

Table 4 shows the results obtained with 11 polyvalent serums and 4 normal horse serums which were given (0.5 cc) intraperitoneally 4 hours before the infecting culture suspension was given by the same route. In these experiments normal horse serum compared very well with the immune serums. With only two strains, 534 (III) and 541 (I–III), did the normal serums, normal R and normal S, fail to show what might be interpreted as a protection as great as that afforded by the average immune serum. Complete protection was never obtained with normal serums, however, whereas immune serums afforded complete protection seven times in the experiments shown in this table. Some of the cultures used here were of relatively low virulence, and it is possible that normal serum would show less effect against more invasive strains. In any case the data shown here afford an interesting comparison of the effect produced by different immune serums, all of which, except the antitoxins, had been released for distribution on the basis of the same serological tests.

TABLE 4.—*Protection afforded by serums given intraperitoneally 4 hours before the infecting dose of meningococci by the same route* [1]

| Experiment no. | Strain | Serum | Mortality | Agglutinin titer of serum with "type strains" | | | |
|---|---|---|---|---|---|---|---|
| | | | | I | II | III | IV |
| | | | *Percent* | | | | |
| 13 | 536 (I) | R | 13 | 444443 | 444421 | 444321 | 444211 |
| | | G (a) | 0 | 444432 | 311100 | 110000 | 000000 |
| | | Normal S | 6 | 00 | 00 | 00 | 00 |
| | | No serum | 26 | | | | |
| | 527 (II) | R | 26 | 444443 | 444421 | 444321 | 444211 |
| | | G (a) | 20 | 444432 | 311100 | 110000 | 000000 |
| | | Normal S | 20 | 00 | 00 | 00 | 00 |
| | | No serum | 46 | | | | |
| 14 | 534 (III) | S | 0 | 444444 | 444444 | 444443 | 444432 |
| | | T | 0 | 444432 | 444443 | 333322 | 444431 |
| | | U (a) | 20 | | | | |
| | | Normal R | 60 | 00 | 00 | 00 | 00 |
| | | No serum | 70 | | | | |
| | 535 (I) | S | 0 | 444444 | 444444 | 444443 | 444432 |
| | | T | 13 | 444432 | 444443 | 333322 | 444431 |
| | | U (a) | 6 | | | | |
| | | Normal R | 13 | 00 | 00 | 00 | 00 |
| | | No serum | 60 | | | | |
| 15 | 534 (III) | V | 0 | 444444 | 444444 | 444443 | 444432 |
| | | W | 0 | 444444 | 444443 | 444443 | 444421 |
| | | X (a) | 10 | 333321 | 333211 | 110000 | 110000 |
| | | Normal R | 10 | 00 | 00 | 00 | 00 |
| | | No serum | 45 | | | | |
| | 535 (I) | V | 10 | 444444 | 444444 | 444443 | 444432 |
| | | W | 10 | 444444 | 444443 | 444443 | 444421 |
| | | X (a) | 5 | 333321 | 333211 | 110000 | 110000 |
| | | Normal R | 15 | 00 | 00 | 00 | 00 |
| | | No serum | 45 | | | | |
| 16 | 541 (I–III) | Y | 13 | 444443 | 444444 | 444443 | 444421 |
| | | Z | 27 | 444432 | 444442 | 444332 | 444321 |
| | | AA | 6 | 444442 | 444443 | 444432 | 444321 |
| | | Normal R | 60 | 00 | 00 | 00 | 00 |
| | | No serum | 73 | | | | |
| | 544 (III) | Y | 20 | 444443 | 444444 | 444443 | 444421 |
| | | Z | 20 | | | | |
| | | AA | 0 | | | | |
| | | Normal R | 66 | 00 | 00 | 00 | 00 |
| | | No serum | 66 | | | | |

[1] Here 0.5 cc serum and 0.5 cc of standardized suspension per 20-gm mouse were given. Each mortality percentage represents 20 mice.

Thus far all experiments had been done with undiluted serums. A study of the effect of diluting them was now undertaken. Intraperitoneal injections of 0.5 cc of undiluted serum and of dilutions 1:5, 1:10, 1:100, and 1:1,000 were given, and were followed in from 1 to 4 hours by 0.5 cc of a standard meningococcus suspension. Six immune serums and six normal horse serums were used, with meningococcus strain 562 (I–III). Table 5 shows the results of these dilution experiments. The normal serums seemed, as a rule, to give protection only when given undiluted, and with normal serums A2 and N none was apparent. Normal O, as in preceding experiments, protected more than most normal horses. This serum was from a horse which had never been injected with anything. On the other hand, most of the polyvalent immune serums showed definite protection in dilutions of 1:100, and some of them in 1:1,000, serums AC and AD especially. With AE and AG a "prezone" would be suggested. By diluting the serums it is apparently possible not only to get an idea of their pro-

tective titer for mice but also to show more clearly the difference between the action of these serums and the effect of normal horse serum. The immune serums definitely offered some protection, but the difference between them and normal serums was not often dramatic.

TABLE 5.—*Protection afforded by various dilutions of immune and normal serums against meningococcus infection in mice*

| Experiment no. | Strain | Serum | Serum dilutions | | | | | Agglutinin titer of serum with "type strains" | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Undiluted | 1:5 | 1:10 | 1:100 | 1:1,000 | I | II | III | IV |
| | | | *Percent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | | | | |
| 17 [1] | 562 (I–III) | Normal A2 | 60 | 100 | 80 | 100 | 60 | 00 | 60 | 00 | 00 |
| | do | Normal E | 20 | 60 | 80 | 60 | 100 | 00 | 00 | 00 | 00 |
| | do | AB | 0 | 40 | 0 | 40 | 100 | 444444 | 444444 | 444443 | 444432 |
| | do | AC | 0 | 20 | 40 | 40 | 40 | 444433 | 444444 | 444432 | 444322 |
| | do | No serum | 00 | 00 | 00 | 00 | 100 | | | | |
| 18 | 562 (I–III) | Normal D2 | 40 | 60 | 87 | 60 | 60 | 00 | 00 | 00 | 00 |
| | do | Normal H | 27 | 67 | 67 | 73 | 33 | 00 | 00 | 00 | 00 |
| | do | AD | 7 | 13 | 7 | 7 | 60 | 444443 | 444444 | 444443 | 444411 |
| | do | AE | 33 | 0 | 13 | 7 | 87 | 444444 | 444444 | 444443 | 444311 |
| | do | No serum | 80 | 80 | 80 | 80 | 100 | | | | |
| 19 | 562 (I–III) | Normal O | 20 | 17 | 30 | 26 | 30 | 00 | 00 | 00 | 00 |
| | do | Normal N | 40 | 53 | 33 | 60 | 40 | 00 | 00 | 00 | 00 |
| | do | AF | 7 | 13 | 7 | 47 | 40 | 444444 | 444444 | 444443 | 444421 |
| | do | AG | 13 | 0 | 13 | 26 | 40 | 443322 | 444444 | 444443 | 444322 |
| | do | No serum | 40 | 40 | 40 | 40 | 40 | | | | |

[1] Fewer mice than usual were used with experiment 17, making individual variation more pronounced.

In the tables the agglutination titer of each serum for the "standard" group strains of meningococci is given. It must be remembered that no two strains of meningococci are exactly alike serologically (*6*) and that the recently isolated strains used in these experiments would not behave identically. The four "standard" strains are those used for the routine testing of all commercial therapeutic antimeningococcic sera for polyvalency and agglutinin content. They were chosen from among other strains because they were most nearly comparable to the four type strains originally described by Gordon and Murray (*13*). All of the polyvalent antimeningococcic serums used in these experiments have high agglutinin content for these "standard" strains, have met the Federal requirements, and have been released for distribution. They compare very well among themselves in titer for demonstrable antibodies.

Exceptions to this uniformity are to be found in the 5 antitoxins included here. These were made for experimental use and were not for sale. They were not made with whole culture suspensions and they were not required to have an agglutinin titer equal to that of the Federal standard serum. It is particularly interesting to see, therefore, that the protection afforded by these antitoxins compares well with that of the usual antibacterial serums, especially when the infecting organisms were of group I.

Comparison of the agglutination titer of all of these serums with their protective action is interesting. There is no proof that high agglutinin content means high therapeutic value, yet the serums which have given best protection were usually, though not always, those which had a high titer. In experiment 4 (table 2) serums F, D, and I, having a very high titer for group II, protected excellently against a group II culture; whereas, G(a) and H(a), antitoxins, practically monovalent for group I from the standpoint of agglutinins, protected somewhat less well against the group II culture. On the other hand, in experiment 13 (table 4) this same antitoxin protected completely against a group I culture. Excellent protection associated with consistently high agglutinin content was found in experiments 14 and 15 (table 4) with serums S, T, V, W, and AA; but antitoxin G(a) and X (a), with relatively low agglutinin content, gave good protection with these I–III cultures also. E (experiment 3, table 1) was a very old serum, at least 5 years old, and protected poorly against all cultures tested, but especially poorly against a strain of group II, for which it had the highest agglutinin content. It seems true that a serum high in agglutinins is more likely to protect well than one with a lower titer, although a high agglutinin content does not guarantee a protection, and a serum with a lower titer is not necessarily of less value. Perhaps a high agglutinin titer simply means that the horses have responded well to immunization.

## DISCUSSION

Generalized infection with meningococci can readily be produced in mice if the cultures used are sufficiently virulent; and mice may be protected against such infection by many of the polyvalent antimeningococcic serums which are on the market today. Such serums vary widely among themselves in their potency, some protecting completely in dilution of 1:100, and others apparently offering little, if any, more protection than some normal horse serums. As a rule, marked protection was associated with a high agglutinin content of the serum, but this was not an absolute rule.

Several antitoxins included among the serums studied compared very favorably with the better serums in affording protection. Normal horse serum showed a protective action which varied greatly among the samples taken from different horses. Pooled horse serums would be more reliable to use as a "control" than samples from individual horses, and such a "control" should always be included when protection studies with immune serums are being made. Such protection by normal serums is sometimes very pronounced, especially with strains of meningococci of relatively low virulence. As a rule, this protection is striking only when the horse serum is undiluted.

In our experience, serum protects mice better when given before the infecting dose of microorganisms, and we have found 4 hours before administration of the culture to be the most favorable time to give the serum.

The most interesting feature of these studies has been the comparison of the degree of protection offered mice by a number of polyvalent antimeningococcic serums, all of which have met the same serological requirements before being released for distribution. Whether or not the degree of protection afforded mice is a criterion of the therapeutic value of a serum for human cases can be settled only by much more work along this line. The most important requisite for such studies will be a reliable method for enhancing and maintaining the virulence of meningococci for mice in order that strains of a definite infecting power can be used. A promising step in this direction has been made by Miller (*3*). In the studies reported in this paper it has been necessary to change strains frequently in order to keep the fatal dose approximately constant, i. e., 0.5 cc of a suspension of a density comparable to 100 parts per million of silica per 20 gm of mouse. Unless tested pure breeds of mice are available, it will be necessary to use sufficient numbers of them so that individual variation can be minimized. It is necessary to use normal horse serum for controls, a pool from several horses being desirable, as protection by the serum of some horses is pronounced.

These studies with a number of commercially prepared polyvalent serums indicate, as have those of Miller with immune rabbit serums (*12*), those of Rake with monovalent horse serums (*11*), and with the serums from meningococcus carriers (*14*), that the mouse is a suitable animal in which to study meningococcus infection and serum protection.

## SUMMARY

A fatal septicemia is readily produced in mice by intraperitoneal injection of sufficiently virulent cultures of meningococci. Studies made in these animals with 33 polyvalent antimeningococcic serums showed a marked protection by a number of them. Five antitoxins that were included compared well with the usual antibacterial serums in protective action. Normal horse serum also afforded a certain amount of protection which varied greatly among individual horses. As a rule the normal serum protected only when given undiluted, whereas some of the immune serums gave protection in dilutions of 1:100 or even higher.

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# A REPORT ON AN EPIDEMIC OF TYPHOID FEVER IN A CIRCUS

By K. E. MILLER, *Senior Surgeon*, and H. E. MILLER, *Special Expert, United States Public Health Service*

## HISTORY OF THE OUTBREAK

While a circus [1] was showing in Cincinnati on July 19, 1934, four of its employees, with symptoms suggestive of typhoid, reported to the circus physician for treatment. Widal specimens were taken and left with a Cincinnati laboratory for diagnosis and on July 23 they were reported negative to the physician while at Detroit. On the same day, patients appeared in large numbers with typhoid symptoms at the quarters of the circus physician. Realizing that he was confronted with what appeared to be a typhoid epidemic, he called the Detroit city health department and the Michigan State Department of Health to the scene, and a routine daily temperature check on all circus personnel was instituted. Owing to the interstate character of circus operations, the participation of the United States Public Health Service in the investigation was invited by the Michigan State Department of Health on July 25, 1934.

On July 23, at Detroit, therefore, it became evident that the circus was in the grip of serious outbreak. Sixty-eight of the employees were taken out on July 23 and 24 and sent to the hospital suspected of having typhoid fever. On July 25, at Flint, 9 more were taken out and sent back to the hospital at Detroit, making a total of 77 hospitalized in that city. Of this number, 44 were proved to have typhoid fever. At Lansing, 6 more were taken out, and at Kalamazoo 3. Six of these proved to be typhoid, bringing the total number of typhoid cases hospitalized in Michigan to 50.

The complete list of typhoid suspects hospitalized and the number of cases ultimately proved to be typhoid fever are shown in the accompanying table.

[1] Ringling Brothers and Barnum and Bailey Circus.

TABLE 1.—*Number of cases hospitalized and number proved to be typhoid fever.*

| Place | Date | Number hospitalized | Number proved to be typhoid |
|---|---|---|---|
| Detroit, Mich | July 23 and 24 | 68 | 40 |
| Flint, Mich | July 25 | 9 | 4 |
| Lansing, Mich | July 26 | 6 | 4 |
| Kalamazoo, Mich | July 27 | 3 | 2 |
| Fort Wayne, Ind | July 28 | 2 | 1 |
| Louisville, Ky | July 30 | 3 | 3 |
| Indianapolis, Ind.[1] | July 31 | 3 | 2 |
| South Bend, Ind | Aug. 1 | 12 | 8 |
| Milwaukee, Wis | Aug. 3 | 4 | 3 |
| Madison, Wis.[1] | Aug. 5 and 6 | 11 | 6 |
| Freeport, Ill | Aug. 7 | 1 | 0 |
| Peoria, Ill.[2] | Aug. 9 | 2 | 0 |
| Springfield, Ill | Aug. 10 | 2 | 0 |
| St. Louis, Mo.[2] | Aug. 11 | 2 | 0 |
| Jefferson City, Mo | Aug. 12 | 1 | 0 |
| Kansas City, Mo | Aug. 13 | 2 | 0 |
| Springfield, Mo.[3] | Aug. 14 | 6 | 1 |
| Oklahoma City, Okla | Aug. 16 | 2 | 0 |
| Wichita, Kans | Aug. 17 | 1 | 0 |
| Total | | 141 | 74 |

[1] At Indianapolis, Ind., Henry Bluebough was sent to the hospital and a positive diagnosis of typhoid was made. He had originally been hospitalized as a typhoid suspect at Harper Hospital in Detroit on July 24, but discharged as negative. Homer Griffin, also discharged from Harper Hospital as negative for typhoid, returned to the circus at Oshkosh, Wis., on Aug. 4, and on the following day he was rehospitalized at Madison, Wis., where typhoid was proved both by clinical and laboratory findings.

[2] 2 men hospitalized at Peoria and 1 man at St. Louis were reported as typhoid cases on clinical diagnosis. Laboratory findings, however, did not support this diagnosis. They were completely recovered and ready to be discharged from the hospital in about 10 days. Since the remainder of the evidence is against their being typhoid cases, they have not been classed as such in this report. Two of these men were members of the performer group ("big-top" bandman and acrobat) and the third of the "big-top" canvas group.

[3] The case of Ruth Pontico, the fat girl, hospitalized at Springfield, Mo., is of especial interest. It would appear that, chronologically, her case developed 8 days after the last previous typhoid cases; but this is not true. She left the show of her own accord at Evanston, Ill., on Aug. 2. 10 days later she returned to the show and stated that she had been in Chicago under treatment by a private physician who sent her back to the circus presumably recovered, with a statement that she did not have typhoid, although she presented a temperature chart characteristic of the disease. It was obvious that she needed further hospital treatment, and she was, therefore, hospitalized at Springfield, Mo. It is understood that she ran a typical course of typhoid, perhaps more severe than usual. The onset of this case, therefore, dates back to Aug. 2 instead of Aug. 14. With these facts established, it will be noted that the last cases to develop were those left at Madison, Wis., on Aug. 5 and 6.

From the foregoing data it may be concluded that the span of the epidemic covered the period from July 23 to August 6—a total of 14 days. Although the last cases might possibly have been secondaries, it is regarded as more probable that they all derived their infection from the same source as that of the original cases. There appears to be a considerable concentration of cases on August 1, and likewise on August 5 and 6. In the former instance it is believed that the large number hospitalized was due in part to a more rigid investigation of the personnel for suspects, so that part of this number probably should be distributed among the preceding 2 or 3 days. In the latter instance it will be noted that six cases represent the incidence for 2 days instead of one. Actually it represents 3 days, since the suspects found at Oshkosh, Wis., on August 4 were carried over to Madison for hospitalization. While 14 days is the usual period of incubation, it is certainly true that some become ill in a shorter length of time and that in others the appearance of symptoms is delayed much longer than 14 days. In an epidemic such as this, therefore, the appearance of new cases trailing on for some time after the peak of the epidemic is more or less to be ex-

pected and not inconsistent with the idea that the epidemic as a whole had its origin in one and the same source of infection.

In approaching the study of this epidemic it is necessary to adjust one's viewpoint to the unique circumstances under which a circus operates. Being constantly on the move, the circus is subjected to an entirely different set of local surroundings each day, or at least at each stand. Not only is this true, but the circus equipment and circus customs are based on the principle of constant mobility.

The following is a list of cities visited after the circus left Madison Square Garden in New York, beginning with June 11, 1934, and ending on August 17, 1934:

June 11, Poughkeepsie, N. Y.
June 12, Waterbury, Conn.
June 13, New Haven, Conn.
June 14, Hartford, Conn.
June 15, Stamford, Conn.
June 16, Bridgeport, Conn.
June 17, Sunday.
June 18, Providence, R. I.
June 19, New Bedford, Mass.
June 20, Fall River, Mass.
June 21, Worcester, Mass.
June 22, Manchester, N. H.
June 23, Springfield, Mass.
June 24, Sunday.
June 25, Albany, N. Y.
June 26, Schenectady, N. Y.
June 27, Syracuse, N. Y.
June 28, Geneva, N. Y.
June 29, Rochester, N. Y.
June 30, Niagara Falls, N. Y.
July 1, Sunday.
July 2, Buffalo, N. Y.
July 3, Jamestown, N. Y.
July 4, Bradford, Pa.
July 5, Allegheny, Pa.
July 6, Pittsburgh, Pa.
July 7, Pittsburgh, Pa.
July 8, Sunday.
July 9, Washington, Pa.
July 10, Wheeling, W. Va.
July 11, Akron, Ohio.
July 12, Youngstown, Ohio.
July 13, New Castle, Pa.
July 14, Erie, Pa.
July 15, Sunday.
July 16, Cleveland, Ohio.
July 17, Cleveland, Ohio.
July 18, Columbus, Ohio.
July 19, Cincinnati, Ohio.
July 20, Dayton, Ohio.
July 21, Toledo, Ohio.
July 22, Detroit, Mich.
July 23, Detroit, Mich.
July 24, Detroit, Mich.
July 25, Flint, Mich.
July 26, Lansing, Mich.
July 27, Kalamazoo, Mich.
July 28, Fort Wayne, Ind.
July 29, Sunday.
July 30, Louisville, Ky.
July 31, Indianapolis, Ind.
Aug. 1, South Bend, Ind.
Aug. 2, Evanston, Ill.
Aug. 3, Milwaukee, Wis.
Aug. 4, Oshkosh, Wis.
Aug. 5, Sunday.
Aug. 6, Madison, Wis.
Aug. 7, Freeport, Ill.
Aug. 8, Davenport, Iowa.
Aug. 9, Peoria, Ill.
Aug. 10, Springfield, Ill.
Aug. 11, St. Louis, Mo.
Aug. 12, St. Louis, Mo.
Aug. 13, Jefferson City, Mo.
Aug. 14, Kansas City, Mo.
Aug. 15, Springfield, Mo.
Aug. 16, Tulsa, Okla.
Aug. 17, Oklahoma City, Okla.

The health status of the show pursued an even course until about July 7, when an explosive outbreak of acute diarrheal enteritis occurred, affecting more or less the entire circus personnel and reaching its peak about July 9. It should be noted that, in circus experience, diarrhea is not at all uncommon, and so the appearance of a few

TABLE 2.—*Epidemiologic data regarding typhoid outbreak in Ringling Bros. Circus in July 1934*

| No. | Name | Age | Sex | Race | Occupation | Train: Section | Train: Car | Onset | Bed | First diarrhea | Time away | Dining room and table | Drinking-water habits | Eating habits: "Back door" | Eating habits: Pie car | Eating habits: "In front" | Eating habits: Public restaurant | Time with circus | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Charles, Lee | 22 | Male | White | Animals | 1 | 70 | July 7 | July 24 | July 7 | | Workers | | | Occasionally | | Occasionally | 6 years | |
| 2 | Yacopi, Robert | 40 | do | do | Performer (acrobat) | 4 | 96 | do | July 23 | | | Table 16 | Own dining room only | Often | Never | | Occasionally | 9 years | In bed July 20 and 21 but not confined. |
| 3 | Moore, Van | 24 | do | do | Cookhouse (kitchen helper) | 1 | 72 | July 9 | July 24 | July 8 | | Workers | Cookhouse | | Occasionally | Never | | Apr. 8 | |
| 4 | Woolsey, Mrs. Maxie | 38 | Female | do | Performer (side show, "bird girl" freak) | 3 | 94 | do | do | do | | Table 33 | | Occasionally | do | | | April | |
| 5 | Graf, Louis | 29 | Male | do | Cookhouse (flunky) | 1 | 72 | July 9 | do | July 9 | | Workers | Cookhouse only | | | | Occasionally | 10 years | |
| 6 | Willard, Tom | 21 | do | do | Cookhouse (dish washer) | 1 | 72 | do | do | do | | do | | Coffee, once | Occasionally | | | 17 years | |
| 7 | Bird, Fred | 34 | do | do | do | 1 | 72 | July 9, 6 a. m | do | do | | do | | Never | Once | | Not in Allegheny or Pittsburgh | June 4 | |
| 8 | Saunders, Clarence | 27 | do | do | Usher (gateman) | 3 | 95 | July 9, a. m | do | do | | Table 29 | | Occasionally | | | Often | April | |
| 9 | Gleco, James | 27 | do | do | Candy butcher | 1 | 71 | July 9, 2 p. m | do | do | | Table 10 | | | April; twice in May | | Frequently away week-ends | 3 years | |
| 10 | Stephen, Carl | 27 | do | do | Canvas (side show) | 2 | 74 | July 9, 4 p. m | do | do | | Workers | Workers' mess and sideshow barrel | | Occasionally | | Not in Pittsburgh | April | |
| 11 | Mann, Mrs. Albert | 23 | Female | do | Performer (aerialist, rider, Wild West) | 4 | 91 | July 9 | do | do | | Table 28 | Cookhouse and performers | | | | Usually off lot | 2 years | |
| 12 | Stone, John | 23 | Male | do | Props (inside) | 2 | 74 | July 13 | do | | | Workers | | Frequently | Frequently | | Not for long time | 5 years | |
| 13 | Hayes, Joseph | 26 | do | do | Animals (camels) | 3 | 94 | July 14 | July 16 | | | do | | | do | Occasionally | | 3 years | Complained about 2 days earlier. |
| 14 | Michael, Earle | 23 | do | do | Usher | 3 | 94 | do | July 24 | July 9 | | Table 34 | | | do | | | 2 years | |
| 15 | Meeker, Stanley | 22 | do | do | Animals (camels) | 3 | 94 | July 15 | do | July 22 | | Workers | | Occasionally | Occasionally | Occasionally | | May 20 | |
| 16 | Lewis, Kent | 27 | do | do | Ticket seller | 4 | 80 | do | do | | | Table 24 | | | do | | Frequently | 4 years | |
| 17 | Kalasinski | 27 | do | do | Lights | 2 | 74 | do | July 25 | July 15 | | Workers | Usually at light plant; seldom workers' mess. | Occasionally | | Frequently | | May 7 | |
| 18 | Shive, Charlotte | 35 | Female | do | Performer (aerialist) | 4 | 39 | do | July 22 | July 12 | | Table 2 | | Every day | | | Frequently | 17 years | Complained to physician July 16. |
| 19 | Wallanda, Helen | 23 | do | do | Performer (wire-walker) | 4 | 83 | do | do | | | Table 5 | Cook house, sleeping car, and dining room only. | Occasionally | | | do | 7 years | |
| 20 | Spurgat, Helda | 35 | do | do | Performer (silver statue) | 4 | 91 | do | July 23 | | | do | | Often | | | Sundays occasionally | April | |
| 21 | Gordon, James | 24 | Male | do | Cookhouse (dining room; silverware) | 1 | 73 | do | July 24 | | | Workers | | | Occasionally | | June–July | do | |
| 22 | Young, Frank | 27 | do | do | Props (inside) | 2 | 74 | do | do | July 8, 4 a. m | | do | | Occasionally | do | Never | Not in Pittsburgh or Washington | May 6 | |
| 23 | Heinz, Ed | 21 | do | do | Lights | 2 | 74 | July 16 | do | July 20 | | do | "All over lot" | do | do | | Not since Baltimore | April | |
| 24 | Fleck, Eugene | 27 | do | do | Performer (wire-walker) | 4 | 90 | do | do | | | Table 5 | Performers table only | Frequently | | | Frequently | do | |
| 25 | Valleky, Frank | 25 | do | do | Canvas (side show) | 2 | 74 | July 17 | do | | | Workers | | | Frequently | Occasionally | | 7 years | |
| 26 | Merritt, John | 42 | do | do | Cookhouse (coffee boy) | 1 | 73 | do | do | | | do | | | | | Not off lot in Pittsburgh or Washington. | | |
| 27 | Smolowitz, Abe | 33 | do | do | Wardrobe | 2 | 78 | do | do | | | do | | Every day | Frequently | | In Pittsburgh | 12 years | |
| 28 | Russare, Sylvester | 26 | do | do | Props | | | do | do | July 9 | | do | | | | | | | |
| 29 | Lytle, William | 44 | do | do | do | 2 | 74 | July 18 | July 23 | July 19 | | do | At electrical department, July 7 | Ham and cheese sandwiches, rolls and coffee. | | | | July 7, 7 p. m | |
| 30 | Davis, Richard | 23 | do | do | Lights | 2 | 74 | July 19 | July 24 | July 23 | | do | | Coffee | | Occasionally | Never leave lot on Sunday | 2 years | |
| 31 | Kinsey, Clarence | 21 | do | do | Side-show canvas (helper) | 2 | 74 | do | do | | | do | | Occasionally | | | Never | April | |
| 32 | Glorieso, Santo | 25 | do | do | Performer (bar) | 4 | 82 | July 20 | do | | | do | | do | | | do | do | |
| 33 | Casper, Edward | 28 | do | do | Barber (concession) | | Bus | do | do | | | Table 1 | Cookhouse only | | | | Occasionally | June 8 | |
| 34 | Wallenda, Henrietta | 15 | Female | do | Performer (wire-walker) | 4 | 83 | do | do | | | Table 5 | | Occasionally | | | Frequent | April | |
| 35 | Hartford, Ray | 26 | Male | do | Trucks | 2 | 77 | July 21 | do | | | Workers | Own tank usually | do | Occasionally | | Very seldom | 2 years | |
| 36 | Belton, Lee | 29 | do | Colored | Canvas (lumber carrier) | 2 | 78 | July 22 | do | | | do | | Never | do | | | Mar. 31 | |
| 37 | Hockey, Joe | 27 | do | White | Cookhouse (waiter) | 1 | 72 | do | do | | | do | Kitchen | Occasionally | Never | Never | | April | |
| 38 | Webster, Robert | 21 | do | do | Canvas (lay-out gang) | 1 | 73 | do | do | | | do | | | | | Seldom; not in Pittsburgh | 4 years | |
| 39 | Nagy, Louis | 29 | do | do | Performer (clown) | 4 | 90 | do | July 25 | | | Table 3 | Cookhouse; dining room | Rarely | Rarely | Not since July 1 | | 5 years | |
| 40 | Rumiana, Victoria | 20 | Female | do | Performer (aerialist) | 4 | 89 | do | July 24 | July 8 | | Table 5 | Performers and cookhouse only | Chocolate milk | | | Frequently | April | |
| 41 | Nay, Bert | 34 | Male | do | Baggage stock (night watchmen) | 1 | 77 | do | July 26 | | | Workers | "All over" | Never | Never | Never | | 8 years | |
| 42 | DeBeck, John | 22 | do | Colored | Ring stock, baggage stock (?) (horses) | 1 | 73 | July 23 | July 25 | | | do | | | do | | | 7 years | |
| 43 | Whitehead, James | 21 | do | White | Usher | 3 | 94 | do | July 24 | July 8 | | Table 34 | Cookhouse and band table | Seldom | | Occasionally | Never | April | |
| 44 | Guzy, Michael | 30 | do | do | Cookhouse (waiter, "roughnecks") | 1 | 72 | do | do | | | Workers | | do | | | | 2 years | |
| 45 | Biladeaux, Emile | 45 | do | do | Cookhouse | 1 | 72 | do | July 27 | July 9 | | do | | Never | | Occasionally | Eats away frequently | 3 years | |
| 46 | Ahern, Joseph | 26 | do | do | Candy butcher | 3 | 97 | do | do | July 8 | Few days, Fall River | Table 36 | "All over"; always fire plugs | Occasionally | Never | Never | Occasionally | 4 years | Immunized in Army. |
| 47 | Neville, George | 26 | do | do | Ticket taker | 4 | 85 | do | do | do | | Table 3 | Many places | Never | | Occasionally | | June 18 | |
| 48 | Schelock, Frank | 30 | do | do | Baggage stock | 1 | 70 | July 25 | do | July 8, 9 a. m | | Workers | "All over" | Occasionally | do | do | | 3 years | |
| 49 | Nelson, Joseph | 22 | do | Colored | Canvas | 2 | 79 | July 26 | July 26 | | | do | Many places | Never | do | do | | April | |
| 50 | McLain, Eugene | 26 | do | White | Cookhouse | 1 | 72 | Several weeks ago | July 24 | | | do | "All over" | Not last 6 weeks | do | do | Frequently | May 1 | |

SUPPLEMENTAL LIST OF CASES OCCURRING AFTER CIRCUS LEFT MICHIGAN

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | O'Rourke, Tex | 26 | Male | White | Candy butcher | (1) | (1) | | July 28 | Not stated | | Table 27 | Not stated | Not stated | Not stated | Not stated | Not stated | Not stated | |
| 52 | Malone, Fred | 22 | do | do | Performer | (1) | (1) | July 24 | July 30 | do | | Table 17 | do | do | do | do | do | do | |
| 53 | Porter, Robert | 32 | do | do | do | (1) | (1) | July 20 | do | do | | do | do | do | do | do | do | do | |
| 54 | Wright, Gordon | 22 | do | do | Cookhouse (dish washer) | (1) | (1) | July 22 | do | do | | Workers | do | do | do | do | do | do | |
| 55 | O'Connor, Robert | 22 | do | do | Canvas (big top) | (1) | (1) | July 28 | July 31 | do | | do | do | do | do | do | do | do | |
| 56 | Bluebough, Henry | 25 | do | do | do | (1) | (1) | July 27 | do | do | | do | do | do | do | do | do | do | |
| 57 | Brown, Robert | 21 | do | do | Candy butcher | (1) | (1) | July 30 | Aug. 1 | do | | Table 26 | do | do | do | do | do | 3 months | |
| 58 | Lermond, Lawrence | 25 | do | do | Performer (clown) | (1) | (1) | July 17 | do | Cleveland | | Table 1 | do | do | do | do | do | 4 months | |
| 59 | Young, Kit | 25 | do | Chinese | Performer (acrobat) | (1) | (1) | July 28 | do | Not stated | | Table 20 | do | do | do | do | do | Not stated | |
| 60 | Webster, Alfred | 21 | do | White | Lights | (1) | (1) | July 19 | do | July 7 | | Workers | do | do | do | do | do | 1 year | |
| 61 | Kelly, Jack | 21 | do | do | Canvas (big top) | (1) | (1) | Not stated | do | Not stated | | do | do | do | do | do | do | Not stated | |
| 62 | Skee, Wm | 22 | do | do | Canvas (side show) | (1) | (1) | do | do | do | | do | do | do | do | do | do | do | |
| 63 | Morrison, David | 22 | do | do | Animals | (1) | (1) | do | do | July 7 | | do | do | do | do | do | do | do | |
| 64 | Cornel, Tom | 55 | do | do | Wagon shop (blacksmith) | (1) | (1) | July 28 | do | | | do | do | do | do | do | do | 8 years | |
| 65 | Dumbos, Charles | 22 | do | do | Tractors | (1) | (1) | July 31 | Aug. 3 | July 11 | | do | do | do | do | do | do | Not stated | |
| 66 | Kusch, John | 22 | do | do | Canvas (big top) | (1) | (1) | Aug. 2 | do | do | | do | do | do | do | do | do | do | |
| 67 | Hownton, Roy | 24 | do | do | Usher | (1) | (1) | July 31 | Aug. 5 | July 7 | | Table 29 | do | do | do | do | do | do | |
| 68 | Bangs, Gerald | 31 | do | do | Performer (clown) | (1) | (1) | July 29 | do | July 16 | | Table 1 | do | do | do | do | do | do | |
| 69 | Stone, John | 32 | do | do | Baggage stock | (1) | (1) | July 28 | do | | | Workers | do | do | do | do | do | do | |
| 70 | Keller, Floyd | 29 | do | do | Tractors | (1) | (1) | July 31 | do | July 9 | | do | do | do | do | do | do | do | Died. |
| 71 | Griffin, Homer | 31 | do | Colored | Performer (colored band) | (1) | (1) | Aug. 1 | do | | In Harper Hospital July 23 to Aug. 5, discharged as negative. | Table 40 | do | do | do | do | do | do | |
| 72 | Dudor, Mike | 22 | do | White | Cookhouse (waiter) | (1) | (1) | July 29 | do | | | Not stated | do | do | do | do | do | do | |
| 73 | Scottnelli, Antonio | 25 | do | do | do | (1) | (1) | July 31 | do | | | do | do | do | do | do | do | do | |
| 74 | Pontico, Ruth | (1) | Female | do | Performer (side show) | (1) | (1) | Aug. 2 | Aug. 14 | Not stated | Aug. 2 to Aug. 14 (see note). | Table 32 | do | do | do | do | do | do | Left circus at Evanston, Ill., Aug. 2 and returned Aug. 13 at Kansas City, Mo., stating that she had been under care of private physician in Chicago since leaving the circus. Physician sent note saying she did not have typhoid, but patient presented temperature chart characteristic of typhoid, was still feeling ill, and was placed in hospital at Springfield, Mo., Aug. 14. Typhoid confirmed by laboratory diagnosis. Typical clinical course. |

[1] Not stated.

cases of diarrhea would not be likely to attract any particular attention. At that time, however, the incidence of diarrhea was such as to create a profound impression upon all groups of the show people. Although a record of all cases applying for medical treatment at that time is not available, the circus physician estimates that from 50 to 70 percent of the entire personnel was affected with acute diarrhea, lasting in most instances from 1 to 2 or 3 days, though a few lasted longer. Upon the subsidence of this trouble, nothing further happened until July 16, when one patient felt sick enough to be confined to bed. This patient did not give a history of previous diarrhea, but dated the onset of illness from July 14, as did several others who were not hospitalized until July 23 or 24. The fact that this patient went to bed on July 16, about a week in advance of the main exodus at Detroit, is not regarded as having any significance aside from the probability that he surrendered to his feelings more quickly than the others. It will be noted that, among those hospitalized at Detroit, 11 complained of continuous illness, dating back to the diarrhea epidemic of July 7, 8, and 9.

The next incident was the taking of four Widals at Cincinnati on July 19, the complaints and symptoms of these patients being such as to raise a suspicion of typhoid. The fact that these were all reported negative is readily explained on the ground that they were taken so early in the course of the disease that antibodies had not yet been formed, thus indicating unusual alertness on the part of the circus physician.

On the following day, July 20, at Dayton, an usher complained of feeling ill and asked to be paid off, saying that Dayton was his home and he wanted to remain there. Subsequently the circus was informed that this man died on July 23, though it is not known definitely whether he had typhoid.

The foregoing description of the epidemic of enteritis is given as it is believed to be a significant antecedent to the typhoid epidemic, the onset of which definitely dated from July 22.

A tabulated summary of the case histories of the first 50 cases, prepared by the Michigan State Department of Health, is presented in table 2. This table also includes 24 cases that developed subsequently, although the data on these cases are somewhat abridged.

The curve representing the chronological hospitalization record of typhoid suspects and cases, together with graphic presentation of the number of diarrhea cases in the period July 7, 8, 9, and the number having diarrhea during that period among those hospitalized at Detroit, is shown in chart 1.

EPIDEMIOLOGICAL DATA

From a study of these data the following facts are deduced:

1. *Age.*—Ages range from 15 to 55, the average being 26.3.

2. *Sex.*—There are 8 females and 66 males, which is approximately the same ratio as exists between males and females throughout the circus.

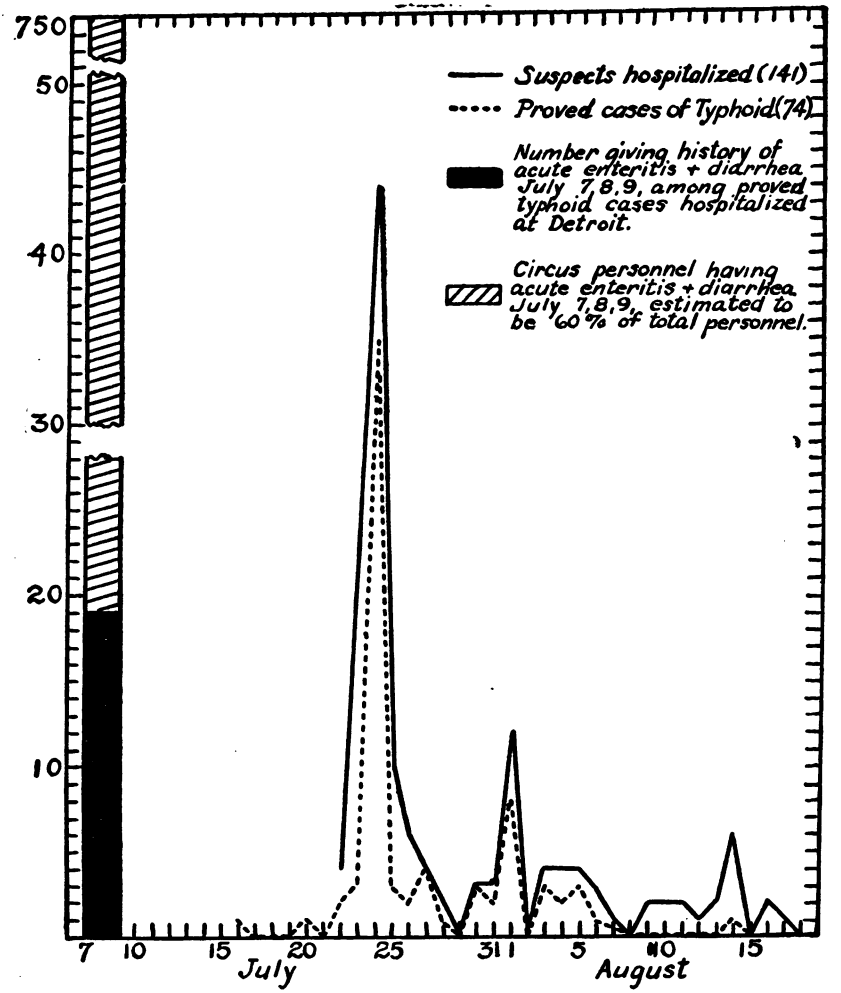



CHART 1.—Chronological hospitalization record and number of cases with history of enteritis and diarrhea

3. *Race.*—There are 4 colored, 1 Chinese, and 69 white. The ratio of colored to white in the entire circus personnel is not known, but it is thought to be approximately as above.

4. *Groups affected.*—The circus is a highly departmentalized institution. Classification into 23 separate groups would seem to be sufficient to provide a very specific designation for each group.

Certain group designations, however, are still rather general and, for a clear conception, should be further subdivided. Cookhouse employees, for instance, include all who are in any way engaged in the handling of dishes and the preparation and serving of food—cooks, flunkies, waiters, and dishwashers. In a study of this kind it makes a great deal of difference as to the exact duties of the infected person about the "cookhouse." Although the record is not specific as regards the duties of certain cookhouse employees, it is known that only two of the cookhouse group were employed in the kitchen, which is the only source from which the entire personnel could have received contaminated food. One of these, Van Moore, was a kitchen helper and the other, Louis Graf, a cookhouse flunky, which probably means the same as kitchen helper. These men became ill simultaneously with the large draft of cases hospitalized at Detroit, and consequently, it must be assumed that they received their infection at the same time as the others, rather than being themselves the source of infection to those with whom they were hospitalized.

The canvas groups are divided into three branches—Whalen's men, 225; Snellen's men, 55; and side-show canvas, 21. In the classi fication employed in this study, the first two groups have been combined to include workers on the "big-top" and all other canvas except the side show, which is a distinct unit.

Under the classification of "performers" there is a wide range of employees—aerialists, acrobats, wire walkers, equestrians, animal trainers, ringmasters, wild-west performers, clowns, musicians, and side-show freaks. Among the performers affected, those subjected to excessive muscular exercise, and high temperatures, high up in the "big top", are the groups who were specially hard hit. These are the persons who are said to consume enormous amounts of water when their acts are finished.

The designations of the other groups are sufficiently specific as to require no special comment.

Table 3 shows the total number in each classification, the number of typhoid cases in each group, and the percentage of the group affected with typhoid, the percentage of the circus personnel represented by each group, and the percentage of total cases occurring in each group. Charts 2 and 3 are graphic representations of these factors.

The only large groups that escaped were the train crew, porters, and elephant men. It should be noted that the trainmen and porters are practically isolated from the rest of the show except for eating in the circus dining rooms. The water supplied to the tanks on the trains is usually separate from that of the rest of the circus, being secured from hydrants that furnish water to Pullman cars. The drinking

water on the cars was formerly secured, in large part, if not wholly, from ice placed in the coolers and allowed to melt. Thus it is seen that the water drunk by the trainmen and porters was either melted ice or water from an approved Pullman car supply. The facts, therefore, seem to be opposed to the idea of a food-borne typhoid epidemic, since the train crew and porters ate in the circus dining rooms. The idea of water-borne infection, however, involving the main body of the circus, but not the trainmen and porters, who drink from a separate source, is highly suggestive.

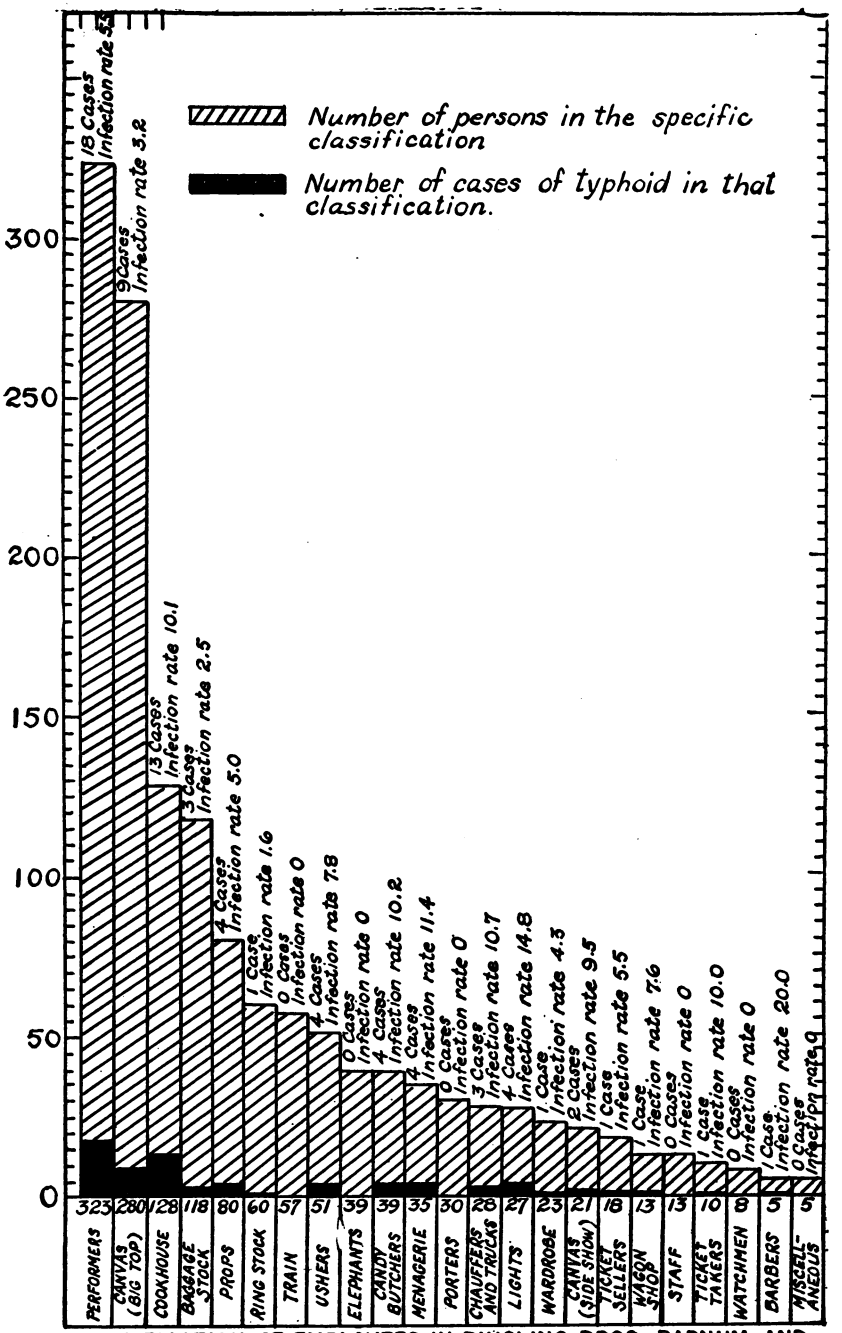
TABLE 3.—*Data according to employee group*

| Classification | No. | Number of cases | Infection rate | Percent of circus population | Percent of cases |
|---|---|---|---|---|---|
| Performers | 323 | 18 | 5.5 | 22.9 | 24.4 |
| Canvas (big top) | 280 | 9 | 3.2 | 19.9 | 12.3 |
| Cookhouse | 128 | 13 | 10.1 | 9.2 | 17.6 |
| Baggage stock | 118 | 3 | 2.5 | 8.4 | 4.1 |
| Props | 80 | 4 | 5.0 | 5.7 | 5.4 |
| Ring stock | 60 | 1 | 1.6 | 4.3 | 1.3 |
| Train | 57 | 0 | 0 | 4.1 | 0 |
| Ushers | 51 | 4 | 7.8 | 3.7 | 5.4 |
| Elephants | 39 | 0 | 0 | 2.8 | 0 |
| Candy "butchers" | 39 | 4 | 10.2 | 2.8 | 5.4 |
| Menagerie | 35 | 4 | 11.4 | 2.5 | 5.4 |
| Porters | 30 | 0 | 0 | 2.1 | 0 |
| Chauffeurs and truckmen | 28 | 3 | 10.7 | 1.9 | 4.1 |
| Lights | 27 | 4 | 14.8 | 1.9 | 5.4 |
| Wardrobe | 23 | 1 | 4.3 | 1.6 | 1.3 |
| Canvas (side show) | 21 | 2 | 9.5 | 1.4 | 2.7 |
| Ticket sellers | 18 | 1 | 5.5 | 1.2 | 1.3 |
| Wagon shop | 13 | 1 | 7.6 | .9 | 1.3 |
| Staff | 13 | 0 | 0 | .9 | 0 |
| Ticket takers | 10 | 1 | 10.0 | .7 | 1.3 |
| Watchmen | 8 | 0 | 0 | .5 | 0 |
| Barbers | 5 | 1 | 20.0 | .3 | 1.3 |
| Miscellaneous | 5 | 0 | 0 | .3 | 0 |
| Total | 1,411 | 74 | 5.24 | 100 | 100 |

The largest number of cases, as might be expected, was among the largest group; namely, the performers. These cases may be subgrouped more specifically as follows:

| | | | |
|---|---|---|---|
| Aerialist | 3 | Clown | 3 |
| Wire walker | 3 | Side show | 2 |
| Bar performer | 1 | Silver statue | 1 |
| Acrobat | 2 | Colored band | 1 |
| Performer (unclassified, probably aerialists) | 2 | Total | 18 |

Every type of performer is represented in the foregoing list. The aerialists and wire walkers are not large groups, but they account for a possible 8 out of the 18 cases in the performer group. These are the groups subjected to excessive heat high up in the big top. It is said that the temperature commonly reached 135° F. on the high wires in July and August. The infection rate among the performer group as a whole, however, was only 5.5 percent, which is only slightly above that of the whole circus.



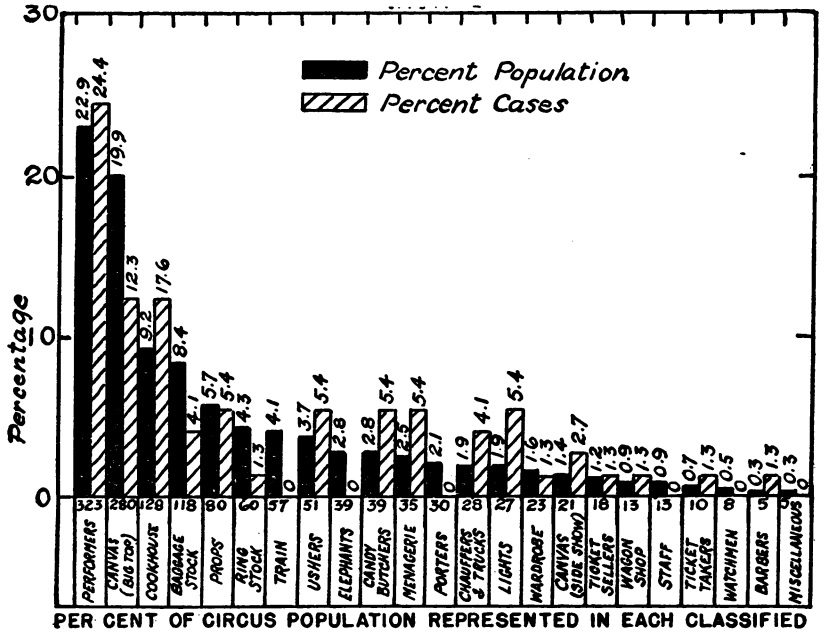

CLASSIFICATION OF EMPLOYEES IN RINGLING BROS.-BARNUM AND BAILEY CIRCUS, THE NUMBER OF PERSONS IN EACH CLASSIFICATION, AND THE NUMBER OF CASES OF TYPHOID IN EACH GROUP.

CHART 2.

The next highest number of cases is contributed by the cookhouse personnel. With less than 10 percent of the population, they account for 17.5 percent of the cases, and the infection rate among them is 10.1 percent. Cases among cookhouse employees occurred simultaneously with the other cases, and so they could not have been involved in originating the epidemic.

Although second in number of personnel, the "big top" canvas group is third in number of cases. With a number representing 19.9 percent of the total circus population, the percentage of cases among them was 12.1 percent, and the infection rate 3.2 percent.

In the next largest group, the baggage stock, the infection rate is low, 2.5 percent. With this may be considered the ring stock, which




PER CENT OF CIRCUS POPULATION REPRESENTED IN EACH CLASSIFIED GROUP, AND PER CENT OF TOTAL TYPHOID CASES CHARGED TO EACH GROUP — RINGLING BROS.-BARNUM AND BAILEY CIRCUS.

CHART 3.

is a closely allied group. The infection rate there is still lower, being 1.6 percent.

The 39 elephant men live and work under conditions which appear to be identical with those under which the menagerie men live and work. There is, therefore, no assignable reason why the elephant group had no cases, while the menagerie men had four.

Aside from the train crew and porters, regarding whom comment has already been made, the case incidence among the remaining groups runs as closely parallel with the case incidence in the circus as a whole as could be expected in view of the small number in the groups involved.

Although the number of cases and the infection rates in the larger units present certain variations, as pointed out above, these differences are believed to be not inconsistent with the chances of morbidity resulting from infection common to all. In fact the outstanding characteristic of this epidemic is the uniformity of distribution of cases among the several groups of the circus personnel.

5. *The distribution* as to train section and car shows nothing significant.

6. *Date of onset of illness.*—This item is meant to indicate the date from which the patient traced continuous illness prior to being put to bed. Eleven date their continuous illness back to the period July 7 to 9, which is coincident with the general epidemic of diarrhea.

7. *The dates of confinement to bed* are as follows:

| | No. | | No. |
|---|---|---|---|
| July 16 | 1 | July 28 | 2 |
| July 22 | 2 | July 30 | 3 |
| July 23 | 3 | July 31 | 2 |
| July 24 | 35 | Aug. 1 | 8 |
| July 25 | 3 | Aug. 2 | 1 |
| July 26 | 2 | Aug. 3 | 3 |
| July 27 | 2 | Aug. 5 and 6 | 6 |

Date of first diarrhea as pointed out above shows that 19 gave positive history of having had diarrhea in the period of July 7 to 9, and that in 11 of these, symptoms of illness were continuous up to the time of hospitalization for typhoid.

9. *The time away from the circus* is of value only as negative evidence. It will be noted that only 1 person had been away from the circus since the season opened, and for only 1 day, many days previous to probable date of the generalized infection.

10. *The dining room.*—It will be noted that the circus operates 3 dining rooms—1 for performers, ushers, musicians, and executive personnel; 1 for white laborers; and 1 for colored laborers. It is only in the performers' dining room that a spotting of cases as to tables and waiters can be done. In this dining room each person has his own place to eat and no one else is ever served at that place, and each waiter serves two specific tables only. In the other dining rooms, however, there is no regularity as to seating. A spotting of cases at tables in the performers' dining room shows that the distribution is more or less general and that there is no concentration at any one table that could be considered significant, with the possible exception of table 5. (See table diagram, chart 4.) Four of the five persons at this table who became ill were females, and at least three of the number were from the same family. There is, however, nothing that can be connected with these cases to give them any special interest from an epidemiological standpoint. The waiter at their table was found negative upon examination for typhoid carrier, and he did not de-

velop the disease. Moreover, as noted above, each waiter served 2 parallel tables, beginning at the entrance end of the dining room, as tables 1 and 2, 3 and 4, and so forth. Therefore, the same waiter who served table 5 also served table 6, which had no cases at all. In like manner, table 3 had two cases, but table 4, which was served by the same waiter, had none. In only two instances are cases found at both tables served by any one waiter. It is, therefore, highly improbable that infected waiters had anything to do with transmission of typhoid in the performers' dining room.

11. *Drinking water.*—The records are not complete regarding the places of drinking and water-drinking habits. The data, however, are sufficient to show that water drinking was not limited to any one

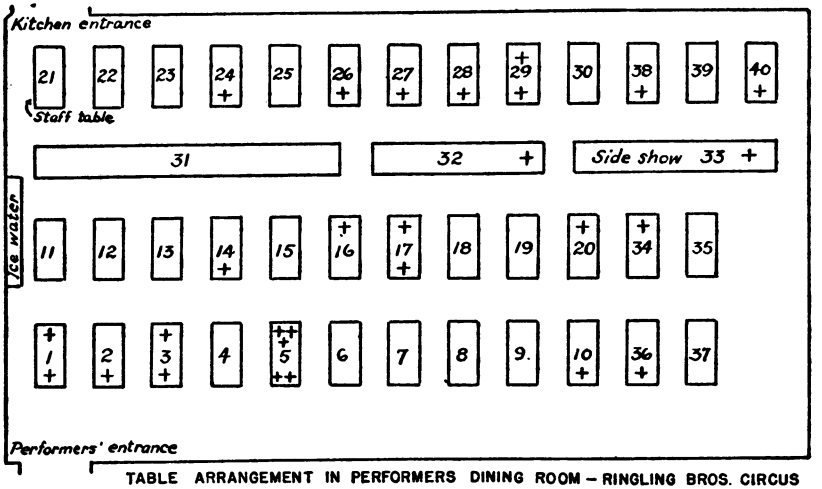



CHART 4.—Table arrangement and distribution of cases (represented by crosses).

common dispensing point. It has been ascertained that the performers, after strenuous exercise in high temperatures, consume an unusual amount of water. The same is said to be true of the cookhouse group, who are subjected to the extra heat of the kitchen.

12. *Eating habits.*—The four columns in table 2 pertaining to eating habits may be considered together. There was formerly what was known as the "back door" restaurant, where employees might secure food, particularly after the cookhouse had been taken down. Also there was a lunch wagon at the front of, or near the entrance to, the circus, from which accessory meals could be secured. These two sources of food were operated by a food concession and moved along with the circus; they were not conducted by the circus. A "pie car" was attached to the train, from which food might be secured en route. All the evidence as to accessory meals secured from the circus and from outside restaurants is consistent in showing that no infection from any of these sources could have been common to all the patients.

13. *Length of time with the circus.*—It is noted that 43 employees joined the circus at or near the beginning of the season, and that the last one to join did so on July 7 at 7 p. m. This man became ill on July 18 and was put to bed with clinical symptoms of typhoid on July 23. This case is regarded as especially significant in fixing the date of the generalized infection on or soon after July 7.

From the foregoing it would appear that the circus personnel as a whole, rather than any isolated group or groups, were subjected to the primary infection simultaneously. Since the infection must gain access to the alimentary tract through the mouth, we must account for some way in which food or water could have become contaminated so as to affect all groups more or less uniformly.

Food is purchased locally at each stand, from the larger dealers, in quantity sufficient only for the day or days at that stand. Any high pollution in the general food supply furnished the circus, therefore, would be expected to give rise to an increased incidence of morbidity in the local community where food from the same source is consumed. There was no indication of excessive diarrhea or typhoid on corresponding dates in the communities visited by the circus.

Food handlers naturally call for close scrutiny because of the possible presence of typhoid carriers. In this classification, including about 200 persons, were the cooks and waiters serving the circus personnel, all food concession men, and all who came in contact with the handling and dispensing of water. Stool examinations were made as follows:

1. *First series:*
   (a) At Louisville (Ky.) State laboratory, 100 (approx.); all reported negative.
   (b) At Indianapolis (Ind.) State laboratory, 100 (approx.); 2 reported positive. These were waiters in the laborer's dining room. As soon as they were discovered, they were promptly discharged and sent home. Both were subsequently negative.
2. *Second series:*
   At Madison, Wis., stool specimens from the entire food handlers' group (about 200), including the 2 reported positive at Indianapolis, were taken and examined in the State laboratory. All specimens were reported negative.
3. *Third series:*
   (a) About one-third taken at Jefferson City, Mo., and examined in the State laboratory. All were reported negative.
   (b) The remainder (128) were taken in Denver and examined in the State laboratory of Colorado. Of this number, 19 were reported positive. All these were promptly sent home with instructions to report to the local health officer, and the local health officer was notified. All but one did report to the local health officer, and all who reported had subsequent stool cultures made. All such cultures have been reported negative. It is understood that only one of this number had had at any time a rise of temperature or reported to the doctor's office for treatment. This man had an upper respiratory infection.

In this connection it should be observed that no small difficulty was encountered in designating cases for hospitalization on the basis of temperature elevations, due to the great prevalence of upper respiratory infections and reactions from typhoid inoculation.

The foregoing serves to show the erratic nature of stool cultures. Up to the time of the Denver report, the discrepancies can be readily harmonized; but the finding of 19 positive out of about two-thirds of the group, and the failure to confirm any of these on subsequent examinations would seem to place the burden of proof upon the Denver laboratory.

The presence of a carrier or carriers among the waiters could not account for the epidemic, as each waiter served only a small group of persons. It is noted in this connection that the dining room from which the greatest number of typhoid-infected waiters were taken was the laborers' dining room; and yet among the laborers the incidence of typhoid was lower than in any other large group. If the infection had come from carriers or infected waiters, the greatest number of cases should have been found among the laborers, not only because the greatest number of infected waiters came from the white laborers' dining room, but because it was here only that any given carrier could have infected more than the normal seating capacity of his table. It has been previously pointed out that, in the laborers' dining room, there is no fixed seating plan carried out, as is the case in the performers' dining room, and so it would have been theoretically possible within a few days' time for any given waiter to have served all the white laborers. Of the two food handlers reported by the Indiana State laboratory as positive for typhoid, one was a colored waiter employed in general service in the colored dining room, while the other worked at the steam table in the white working men's side (long end). A third man reported as positive for dysentery bacillus served soup to the white working men. The only place where a typhoid carrier could affect the entire circus personnel would be in the kitchen. It is interesting to note that the incidence of illness in the kitchen personnel is extremely low, there being only two cases of typhoid found in that group. But, assuming that there were carriers in the kitchen, it is noteworthy that typhoid did not occur prior to the present epidemic.

The circus had been on the road for about 3 months before the appearance of sickness, with exceedingly small turn-over in the kitchen personnel. With a carrier in the kitchen the distribution would almost certainly have been quite irregular with respect to different groups and classifications in the circus.

An investigation as to purchase of certain foods, such as lettuce, celery, and cabbage, does not reveal anything significant. Fresh milk can be readily ruled out for the reason that its use is not general. Among the few who did use it there were no cases of typhoid.

Ice has also been considered as a possible source of infection. During the hot summer months, ice is used in large quantities, averaging around 10,000 pounds per day. It is, moreover, an article used in common by all, in ice water, table beverages, and the drinking water derived from melted ice in the coolers on the sleeping cars. In the last-named instance any infection that might have been present would have been in concentrated form, whereas it would be subject to considerable dilution in all others. Contaminated ice, therefore, would be expected to give rise to the heaviest typhoid infection among the train crew and porters, whose drinking water was derived almost wholly from melted ice. There were no cases of typhoid, however, among these two groups. The use of natural or lake ice is of special interest as a possible source of infection. According to the records, natural ice was used only at Geneva, N. Y., on June 28, about 10 days prior to the epidemic of dysentery and 24 days prior to the outbreak of typhoid.

Since food and ice contamination can apparently be dismissed as quite improbable, if not impossible, the study narrows down to a consideration of water. Certainly this is an article used in common by all, and during the hot weather in very large quantity. Moreover, the whole picture is typically that of an epidemic due to water from some highly polluted source. There is first the vast crop of diarrheal cases due, perhaps, to colon bacillus, or some other sewage organisms; then, after the usual interval of about 14 days, comes the typhoid epidemic in full force; and finally, the straggling incidence of cases for about 2 weeks following the peak of the epidemic.

Here again the same question arises as with contaminated food supplies; namely, How could the circus personnel become affected from a public water supply while the local community was free? In some cities, and especially in highly industrialized areas, there are 2 water supplies, 1 for drinking and domestic use and 1 for fire protection. The latter is commonly raw, untreated water which may be highly polluted. The water supply for a given day might have been derived by mistake from such an accessory supply. One of the most dangerous practices in the public water supply business is the use of cross connections between the domestic supply and the raw, untreated accessory fire protection supply. It is entirely possible that the water supply might have been derived from a domestic supply hydrant but had become polluted by drawing raw water through a nearby leaky cross connection. The usual location of the circus lot is far removed from the residential section of a city. It is, therefore, probable that infection might have been picked up in the manner indicated without similar infection appearing among local domestic consumers. Another possibility, which, however, could appear to be remote is that the water might have been drawn from a dead-end water main lying

in close proximity to a leaky sewer. In this case there would also have to be a leaky joint in the water main through which the pollution could be sucked in when the water was being taken from the water line.

Bathing in a polluted stream has been advanced as still another possible explanation of the infection. Assuming that the outbreak of diarrhea was in any way connected with the typhoid epidemic, this theory would presuppose that at least 60 percent of the circus personnel on the same day went in bathing in the same polluted water, and that all of them got an appreciable amount of polluted water into the alimentary tract. It is hardly conceivable that such a large proportion of the circus personnel should suddenly decide to go bathing in a polluted body of water not frequented by the public generally. But granting this as being possible, it is certainly contrary to all experience and even to common sense to assume that all of them ingested polluted water. Furthermore, this theory presupposes that, since practically all groups were affected with diarrhea or typhoid, practically all groups went in bathing together. This is contrary to social custom and standards in the circus. Moreover, if this theory were correct, it would indicate that not only did 60 percent go in bathing, and that all of these took into the alimentary tract polluted water, but that the infection rate for diarrhea was 100 percent and the rate for typhoid was approximately 10 percent. Both of these latter concepts are quite untenable. Finally, although this inquiry was not made in the original epidemiological study, questioning of circus employees gave conclusive evidence that this theory was also contrary to fact.

## SANITARY EQUIPMENT AND PRACTICE

The Ringling Circus has been in operation for over 50 years, during which time it is said that only one epidemic occurred among the circus personnel. This was a smallpox epidemic in Mexico about 1910. Since that time no one has been permitted to join the circus without proper smallpox vaccination. Having encountered no troubles heretofore in which faulty sanitation was particularly involved, sanitary factors had never been brought under critical study. The circus is perhaps dominated by traditional custom more than any other great enterprise. Being a little self-contained world of its own, the circus has perpetuated outgrown sanitary practices without being influenced by modern sanitary advancement.

In order to give a picture of the sanitary situation as it existed prior to the typhoid epidemic, the findings of the sanitary survey made on July 26 are presented in the following:

1. WATER (SOURCE)

The advance men, or so called "24-hour men", make a contract in each city for water to be furnished on the day or days that the circus is to be at that locality. Usually it is a municipally owned water supply, but sometimes it is one owned by a private water company under municipal control. No specifications as to standard of purity were included in the contract.

Water on the circus grounds is used for the following purposes: (*a*) For drinking water and other domestic use in the cookhouse and about the grounds; (*b*) for watering the animals; and (*c*) for sprinkling. Safety of the water is much less essential for the latter two purposes than for the first, except for the fact that men in the horse "tops" commonly drink from the same bucket from which the horses are served. All tanks on wagons and trucks on the circus grounds were filled from the top by means of a fire hose inserted into the tank.

The method of serving drinking water was found to be exceedingly crude in most instances, the prevailing custom being to use a barrel, keg, or bucket with ice immersed in the water, and the water was served to the individual by means of a common dipper or cup.

*Water on the sleeping cars.*—Each sleeping car is equipped with overhead tanks averaging about 300 gallons per car. Water from these tanks is said to have been used for lavatory purposes only. These tanks are filled ordinarily from the railroad yard supply, which is separate from that from which the circus lot supply is derived. Water for filling the car tanks is secured by means of direct hose-to-hose connection with the city supply. There is a permanent hose line installed on top of cars so that the nozzles emptying into the storage tanks never come in contact with surface dirt or filth.

Drinking water on the cars was said to be derived entirely from ice placed in the coolers and allowed to melt. There are abundant indications, however, that, during the extremely hot weather, the melting ice did not furnish sufficient water to meet the demands, and that it was supplemented by water from storage tanks, which was in all probability safer for drinking purposes than water from melted ice, as the ice was necessarily subjected to contamination by handling. Water drawn from the coolers was served to the individuals by means of cups and glasses used more or less in common with the other occupants of the car.

2. LATRINES (ON THE CIRCUS GROUNDS)

Nothing worthy of the name of latrine was found. It was customary to dig a shallow trench or none at all over which was installed a straddle bar or, in a few instances, a seat arrangement, with no attempt to exclude flies. The principal function of the so-called

"latrine", however, was to afford privacy from public view by means of canvas side walls.

*Toilet facilities on the cars.*—The cars were equipped with galvanized iron buckets swung under each toilet commode for use when the cars were parked. No disinfectant or fly repellant was used. The contents of these containers were supposed to be disposed of by earth burial, but there are grounds for speculation as to the efficiency of this service.

3. COOKHOUSE

(*a*) *Dishwashing.*—The equipment in each instance consisted of 2 tubs of water, 1 for washing the dishes and 1 for rinsing. The temperature of the water was ordinarily little more than lukewarm. Both wash and rinse water became heavily charged with food particles, so that the solution commonly resembled a thick soup. Dishes withdrawn from the rinse water were seen to have numerous food particles still clinging to them. Dish towels soon became water-soaked and laden with grease and food particles.

(*b*) *Protection against flies.*—Bread and other food supplies on the tables and in the kitchen were not sufficiently guarded against flies.

(*c*) *Food handlers.*—Cleanliness of outer garments and personal cleanliness were found considerably below standard. The custom in serving meats and many other foods to the plates was by the hands direct, without the use of serving forks or other suitable instruments. Physical examination of food handlers had not been carried out and no stool examinations for typhoid carriers had been made. Mixed garbage and refuse of all kinds were disposed of by dumping on the surface of the ground.

4. TYPHOID INOCULATION

No effort had been made to require or encourage individual antityphoid prophylaxis. Only 143 gave history of previous typhoid inoculation.

SANITARY MEASURES INSTITUTED

Although the findings fail to indicate any source within the circus itself which could have been held responsible for the epidemic, the following sanitary measures were instituted by the circus management, upon recommendation of officers of the United States Public Health Service, to safeguard against secondary cases and provide the maximum protection for the future through precautionary practices applicable to conditions under which the circus operates:

1. The advance men were required to secure statements from the local health officer certifying that the water supply conforms to the standards for interstate traffic, that the ice contracted for is from an approved source, and that the milk is of a safe quality and pasteurized.

2. Water was required to be taken only from hydrants designated by a responsible employee of the water company and opened by him personally or by his representative.

3. Water tanks were remodeled so as to prevent the insertion of a hose into the tank.

4. All water tanks, storage tanks on cars, and cooler tanks were chlorinated once each week.

5. All containers for dispensing drinking water were replaced by covered coolers with spigots. The coolers were so constructed that ice should not come in contact with the drinking water.

6. The common dipper or cup was prohibited, and replaced by single service paper cups.

7. Each unit of the circus was equipped with adequate latrine facilities. Also suitable latrines were provided for public use. The latrines consist of an earth pit, usually 3 feet deep, and covered at the top by a collapsible fly-proof steel latrine seat. When placed over the latrine pit the earth is banked around where the bottom rests upon the ground so as to insure against the entrance of flies. The seat openings are covered with fly-tight lids. Sufficient chloride of lime is used so as to repel flies, destroy odors, and disinfect the latrine contents. In the men's latrines there is an accessory urinal trench, which also is generously treated with chloride of lime. These latrines were placed under constant supervision by circus attendants. The location of these latrines must be satisfactory to the local health officer.

8. In the cookhouse, temporary improvement in the dishwashing arrangements was effected by requiring all dishes, after being rinsed, to be passed through a chlorine sterilizing bath. As a permanent measure, however, the order was placed for a dishwashing machine to be mounted in a special truck, together with its own power unit and water tanks, whereby hot and cold water can be supplied under pressure. This unit was delivered at St. Louis on August 11, and is reported to have been in constant and efficient use ever since.

Food on the table and in the kitchen was guarded against flies by coverings insofar as practicable.

Food handlers were placed under rigid supervision as regards clothing and personal cleanliness. The serving of foods by means of proper utensils was required. All food handlers were physically examined for tuberculosis, venereal disease in communicable form, and all other communicable diseases. In addition, two samples of stools and urine were taken from each to rule out any typhoid carriers. All reported positive were immediately discharged and returned home in custody of local health officers.

As regards garbage disposal, the first requirement was a separation of food refuse from tin cans and combustible material. The latter was

burned before the site was abandoned. For the food refuse, an earth pit of suitable proportions was dug near the kitchen. The garbage during the day was deposited in this pit, which was covered over with earth at the end of the day. In some cities the garbage was deposited directly into garbage trucks furnished by the city.

The entire circus personnel was subjected to antityphoid inoculation.

As a surety that every phase of health protection for the circus personnel and the public will be adequately guarded in the future, the circus engaged two additional employees for the remainder of the season. One of these is a medical man to have charge of the medical phases of health protection, and the other a highly trained and experienced sanitary supervisor.

For the future guidance of the circus regimen along sanitary lines a set of standard sanitary regulations was drawn up. These regulations are presented in the appendix.

## SUMMARY

(1) In the early part of July there occurred among the employees of the circus an extensive epidemic of diarrhea having all the characteristics of so-called winter cholera, which was followed 2 weeks later by an explosive epidemic of typhoid fever.

(2) There were, in all, 77 proved cases of typhoid fever. The span of the epidemic, with the exception of 2 cases, covered the period July 22 to August 6.

(3) The findings relative to typhoid carriers among food handlers are confusing, and their reliability in some instances is questionable.

(4) The distribution of cases is more or less uniform throughout the circus personnel; all the larger groups, with the exception of trainmen, porters, and elephant men, were affected. The infection rate in the various groups presents no concentration that might be considered significant.

(5) The possibilities (1) that the infection was introduced through infected food or milk, or food which might have become contaminated in the process of preparation and serving, (2) that it was due to ice or to bathing in polluted water, and (3) that it was due to contaminated drinking water, have all been duly considered.

## CONCLUSIONS

(1) The nature of the epidemic is such as to establish the hypothesis that infection was shared in common by practically all groups in the circus, that it was received by all simultaneously and at one time only, that it came from without rather than from within the circus, and that it was a heavy dosage of contamination consisting of sewage organisms superimposed on typhoid infection.

(2) The evidence is such as to make it highly improbable, if not impossible, for the epidemic to have been caused by infected food, typhoid carriers, infected ice, or bathing in polluted water.

(3) The characteristics of this epidemic are in all respects typical of and consistent with water-borne infection. The fact that the trainmen and porters, whose drinking-water supply is separate from that of the others of the circus, had no cases of typhoid tends to support this view.

(4) While the conclusion that the epidemic had its origin in polluted drinking water appears to be reasonably certain, the exact place where the infection was picked up cannot be positively determined, though the facts indicate that it was probably somewhere in western Pennsylvania.

ACKNOWLEDGMENTS

The Michigan State Department of Health rendered valuable aid in the study and control of this epidemic. The information contained in the epidemiological table was secured and arranged in large part by that department. A splendid spirit of cooperation was met with on the part of most city health officers where the circus showed. Especially notable in this connection were the city health officers of Detroit Mich., and South Bend, Ind. An essential part of this study is the stool and urine examinations of food handlers. For this service we are specially indebted to the State health offices of Kentucky, Indiana, Wisconsin, Missouri, and Colorado.

## Appendix

### STANDARD SANITARY REGULATIONS

#### COOKHOUSE

1. *Water Supply:*
   - *a.* The drinking water shall be secured from the tank designated as drinking-water supply tank.
   - *b.* Water for drinking shall be from the standard covered drinking-water coolers, equipped for spigots for drawing water.
   - *c.* Drinking water shall be served only in clean individual service paper cups.
   - *d.* The use of the common drinking cup or dipper and the practice of dipping drinking water are expressly forbidden.
   - *e.* All ice used in water coolers shall be thoroughly rinsed with clean water after breaking and before being placed in coolers.
   - *f.* All coolers shall be kept clean at all times and thoroughly sterilized once each week in accordance with the instructions of the Superintendent of Sanitation.
2. *Food Handling:*
   - *a.* All food shall be protected against flies, dust, and other sources of contamination to the greatest possible extent at all times, by means of covering and through other practical measures.

*b.* All cookhouse employees (especially cooks and waiters) shall wear clean outer garments and present evidence of personal cleanliness. All employees handling food shall wash their hands thoroughly with soap and water before entering on duty. All cookhouse employees shall wash their hands thoroughly with soap and water after each visit to the toilet while on duty before returning to duty.

*c.* Wash basins and individual towels, either paper or cloth, adequate both as to number and distribution, shall be provided at all times for the use of cookhouse employees.

*d.* All dishes, after being washed, shall be removed from the dishwashing machine; stored, and handled in a manner to prevent soiling or recontamination.

*e.* Health certificates: Each food handler shall have a certificate from a properly qualified health officer attesting the fact that he is free from venereal disease in a communicable form, is free from evidence of tuberculosis or other communicable disease, and is free from evidence of being a typhoid fever carrier, as indicated by two or more successive stool cultures. The certificate shall also show that he is immune to smallpox and has been inoculated against typhoid fever in the past 3 years. The health certificate shall not be considered valid after 6 months.

3. *Garbage Disposal:* All garbage and refuse must be separated.

*a.* All paper, trash boxes, and other combustible material shall be collected so as to prevent a nuisance.

*b.* Table scraps and other organic garbage shall be collected in covered, water-tight, metal garbage cans. Distribution of cans as to number and location shall be adequate to provide for the collection of garbage at all points where garbage accumulates.

*c.* Except where garbage is collected from the containers by the city or some other agency which will wholly remove same from the grounds, all garbage shall be buried with at least 2 feet of earth, in accordance with instructions of the Superintendent of Sanitation.

4. In addition to the foregoing, all other practicable measures for insuring the safety of food shall be carried out at all times in accordance with the instructions of the Superintendent of Sanitation.

NOTE.—In all towns the "24-hour man" shall use every effort to get a covered garbage wagon to remain at the cookhouse during show day.

FOOD DISPENSED TO THE PUBLIC

1. Sanitary regulations governing the cookhouse shall apply in all respects to all candy butchers and other persons in any way engaged in preparation or dispensing of food to the public, with the following exceptions:

1. When hand dishwashing is done, the dishes shall first be washed in hot water with soap or washing powders, passed through a clean hot water rinse, and again rinsed in a rinse water treated with chlorine to sterilizing strength.

2. Dish towels shall be boiled and rinsed through chlorine sterilizing solution after each use.

3. The cooling water in which all bottled goods are cooled shall at all times be treated with chlorine to sterilizing strength.

DISTRIBUTION AND SERVICE OF DRINKING WATER

1. The use of the common drinking cup or dipper and the practice of dipping drinking water are expressly forbidden. Single service paper drinking cups shall be provided in sufficient quantity at all water coolers.

2. All water coolers shall be kept clean, shall be kept covered and shall be sterilized with hypochlorite of lime once each week, in accordance with the instructions of the Superintendent of Sanitation.

3. Circus water tank wagons shall be the only source of water supply used for filling drinking water coolers.

INSTALLATION AND MAINTENANCE OF LATRINES

1. The initial operations of setting up equipment of any department on the circus lot shall include the installation of the latrines and urinal trenches for the department.

2. Chloride of lime shall be applied to latrine trenches and urinal trenches in accordance with the instructions of the Superintendent of Sanitation.

3. The foreman in charge of the department shall be responsible for the sanitary maintenance of latrines serving the department.

FILLING TANKS AND TANK TRUCKS

1. No person connected with the circus, except those responsible for filling the tanks, shall be permitted to take water from any hydrant or other source.

2. The hydrants from which water is taken shall not only be pointed out by a responsible employee of the contracting company, or city, in person, but shall be opened by him or under his direct supervision.

3. Water for all purposes on the circus lot shall be obtained from the circus tanks.

4. All circus water tanks shall be maintained at all times in such condition as not to impair the quality of the water in the tanks or render the same unfit for drinking.

5. The hose used for filling tanks from the hydrants shall be handled at all times in such manner as to prevent the soiling or contamination of surfaces that come in contact with the water discharged into the tank.

6. All circus water tanks shall be sterilized once each week with chloride of lime in accordance with the instructions of the Superintendent of Sanitation.

WATER SUPPLY AND EXCRETA DISPOSAL FOR CARS

1. *Water Supply*: Coolers and tanks on cars shall be filled only from—
   1. The approved drinking water supply source in railroad yards approved by the United States Public Health Service for use on Pullman and railway passenger cars, or
   2. A hydrant on the public water-supply system, which shall not only be pointed out by a responsible employee of the contracting company, or city, in person but shall be opened by him or under his direct supervision.
   3. The hose and other equipment used for filling tanks and coolers shall be handled in a sanitary manner, and the surfaces which come in contact with the water shall be protected against contamination from handling or by soiling with dirt or filth.
   4. All ice used in coolers shall be clean artificial ice. All ice shall be thoroughly rinsed with clean water after it has been broken and before being placed in coolers.

5. All persons engaged in handling or the distribution of drinking water or in handling ice used in coolers shall conform to the requirements of the health certificate and personal cleanliness as prescribed for food handlers.

2. *Excreta Disposal:*
   1. All excreta cans shall be emptied as required as to prevent a nuisance.
   2. Whenever the contents of excreta cans are not removed by a scavenger service in such manner as completely to remove all such material from the vicinity of the cans, the contents of cans shall be buried under a 2-foot covering of earth.
   3. All excreta cans shall be treated regularly with disinfectant solution in accordance with the instructions of the Superintendant of Sanitation.

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## DEATHS DURING WEEK ENDED MAY 18, 1935

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

| | Week ended May 18, 1935 | Corresponding week, 1934 |
|---|---|---|
| Data from 86 large cities of the United States: | | |
| Total deaths | 8,381 | 8,081 |
| Deaths per 1,000 population, annual basis | 11.7 | 11.3 |
| Deaths under 1 year of age | 550 | 621 |
| Deaths under 1 year of age per 1,000 estimated live births | 50 | 58 |
| Deaths per 1,000 population, annual basis, first 20 weeks of year | 12.5 | 12.4 |
| Data from industrial insurance companies: | | |
| Policies in force | 67,773,031 | 67,789,577 |
| Number of death claims | 14,299 | 13,559 |
| Death claims per 1,000 policies in force, annual rate | 11.0 | 10.4 |
| Death claims per 1,000 policies, first 20 weeks of year, annual rate | 10.7 | 11.0 |

# PREVALENCE OF DISEASE

*No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring*

## UNITED STATES

### CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

**Reports for Weeks Ended May 25, 1935, and May 26, 1934**

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 25, 1935, and May 26, 1934*

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 |
| New England States: | | | | | | | | |
| Maine | 1 | 7 | 3 | ---- | 172 | 13 | 0 | 0 |
| New Hampshire | ---- | ---- | ---- | ---- | 12 | 93 | ---- | 0 |
| Vermont | ---- | ---- | ---- | ---- | 49 | 28 | 0 | 0 |
| Massachusetts | 11 | 7 | ---- | ---- | 378 | 1,116 | 2 | 1 |
| Rhode Island | 1 | 2 | ---- | ---- | 488 | ---- | 3 | 0 |
| Connecticut | 1 | ---- | 2 | 1 | 918 | 173 | 0 | 3 |
| Middle Atlantic States: | | | | | | | | |
| New York | 29 | 49 | [1] 5 | [1] 19 | 2,904 | 1,027 | 12 | 2 |
| New Jersey | 23 | 12 | 6 | 21 | 2,258 | 703 | 3 | 2 |
| Pennsylvania | 36 | 58 | ---- | ---- | 2,877 | 3,725 | 9 | 7 |
| East North Central States: | | | | | | | | |
| Ohio | 38 | 9 | 5 | 6 | 1,241 | ---- | 13 | 3 |
| Indiana | 13 | 12 | 7 | 26 | 270 | 1,067 | 4 | 2 |
| Illinois | 57 | 32 | 10 | 10 | 1,675 | 2,291 | 20 | 7 |
| Michigan | 12 | 8 | 3 | 4 | 4,316 | 375 | 3 | 3 |
| Wisconsin | 1 | 5 | 18 | 13 | 1,694 | 2,228 | 2 | 1 |
| West North Central States: | | | | | | | | |
| Minnesota | 4 | 5 | ---- | 1 | 523 | 174 | 3 | 1 |
| Iowa | 9 | 2 | 5 | 5 | 231 | 302 | 2 | 2 |
| Missouri | 23 | 21 | 36 | 11 | 332 | 540 | 7 | 5 |
| North Dakota | ---- | 6 | 4 | ---- | 32 | 131 | 0 | 1 |
| South Dakota | 2 | 5 | ---- | ---- | 35 | 214 | 0 | 2 |
| Nebraska | 4 | 5 | ---- | ---- | 191 | 185 | 1 | 0 |
| Kansas | 3 | 8 | 1 | 1 | 656 | 547 | 3 | 0 |
| South Atlantic States: | | | | | | | | |
| Delaware | 1 | ---- | ---- | ---- | 12 | 136 | 0 | 0 |
| Maryland [2] | 11 | 7 | 6 | 9 | 96 | 1,895 | 8 | 0 |
| District of Columbia [3] | 12 | 8 | ---- | 3 | 66 | 48 | 10 | 0 |
| Virginia [3] | 15 | 7 | ---- | ---- | 683 | 1,131 | 6 | 1 |
| West Virginia | 8 | 6 | 35 | 21 | 357 | 187 | 1 | 1 |
| North Carolina [3] | 10 | 12 | 4 | 10 | 131 | 1,332 | 2 | 1 |
| South Carolina | 1 | 6 | 119 | 117 | 12 | 217 | 0 | 0 |
| Georgia [4] | 10 | 5 | ---- | ---- | 26 | 206 | 0 | 1 |
| Florida | ---- | 1 | 1 | 1 | 39 | 266 | 0 | 0 |
| East South Central States: | | | | | | | | |
| Kentucky | 4 | 7 | 9 | 10 | 268 | 632 | 2 | 0 |
| Tennessee | 5 | 7 | 12 | 9 | 24 | 333 | 7 | 0 |
| Alabama [4] | 8 | 13 | 7 | 18 | 119 | 618 | 1 | 4 |
| Mississippi [2] | 3 | 12 | ---- | ---- | ---- | ---- | 1 | 1 |

See footnotes at end of table.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 25, 1935, and May 26, 1934*—Continued

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 |
| West South Central States: | | | | | | | | |
| Arkansas | 5 | 5 | 38 | 22 | 83 | 69 | 0 | 0 |
| Louisiana | 13 | 10 | 5 | 2 | 24 | 157 | 1 | 1 |
| Oklahoma [5] | 4 | 5 | 47 | 31 | 65 | 167 | 1 | 2 |
| Texas [4] | 31 | 30 | 57 | 85 | 54 | 479 | 6 | 4 |
| Mountain States: | | | | | | | | |
| Montana [3] | 2 | 3 | 54 | 7 | 389 | 107 | 0 | 0 |
| Idaho | | | 3 | 3 | 9 | 24 | 0 | 1 |
| Wyoming [3] | | | | | 71 | 88 | 0 | 0 |
| Colorado | 2 | 6 | | | 339 | 809 | 1 | 2 |
| New Mexico | 1 | 4 | 7 | 1 | 18 | 74 | 1 | 2 |
| Arizona | 7 | | 8 | 5 | 22 | 11 | 2 | 0 |
| Utah [2] | 2 | | 2 | | | 46 | 0 | 0 |
| Pacific States: | | | | | | | | |
| Washington | | 4 | | | 286 | | 1 | 1 |
| Oregon [3] | | 1 | 21 | 27 | 182 | 39 | 0 | 0 |
| California | 23 | 25 | 32 | 21 | 1,612 | 1,119 | 14 | 0 |
| Total | 446 | 446 | 572 | 520 | 26,239 | 25,122 | 152 | 64 |
| First 21 weeks of year | 13,475 | 15,657 | 100,109 | 44,686 | 576,371 | 558,589 | 2,995 | 1,187 |

| Division and State | Poliomyelitis | | Scarlet fever | | Smallpox | | Typhoid fever | |
|---|---|---|---|---|---|---|---|---|
| | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 |
| New England States: | | | | | | | | |
| Maine | 0 | 0 | 6 | 19 | 0 | 0 | 2 | 2 |
| New Hampshire | | 0 | 12 | 8 | | 0 | | 0 |
| Vermont | 0 | 0 | 2 | 30 | 0 | 0 | 1 | 1 |
| Massachusetts | 2 | 2 | 234 | 237 | 0 | 0 | 1 | 0 |
| Rhode Island | 0 | 0 | 9 | 20 | 0 | 0 | 0 | 0 |
| Connecticut | 0 | 0 | 130 | 57 | 0 | 0 | 1 | 1 |
| Middle Atlantic States: | | | | | | | | |
| New York | 2 | 2 | 1,105 | 765 | 0 | 0 | 6 | 13 |
| New Jersey | 1 | 2 | 177 | 197 | 0 | 0 | 2 | 3 |
| Pennsylvania | 0 | 1 | 564 | 646 | 0 | 0 | 5 | 7 |
| East North Central States: | | | | | | | | |
| Ohio | 0 | 3 | 533 | 461 | 0 | 2 | 0 | 11 |
| Indiana | 0 | 1 | 79 | 98 | 1 | 1 | 2 | 5 |
| Illinois | 0 | 2 | 1,184 | 424 | 5 | 0 | 5 | 3 |
| Michigan | 0 | 0 | 374 | 635 | 0 | 1 | 7 | 1 |
| Wisconsin | 1 | 1 | 538 | 272 | 7 | 24 | 1 | 3 |
| West North Central States: | | | | | | | | |
| Minnesota | 0 | 1 | 279 | 72 | 4 | 7 | 3 | 4 |
| Iowa | 0 | 0 | 79 | 41 | 3 | 1 | 4 | 0 |
| Missouri | 0 | 3 | 48 | 71 | 6 | 0 | 3 | 0 |
| North Dakota | 0 | 0 | 83 | 27 | 0 | 0 | 3 | 1 |
| South Dakota | 0 | 0 | 11 | | 9 | 5 | 0 | 0 |
| Nebraska | 0 | 0 | 54 | 24 | 39 | 4 | 0 | 0 |
| Kansas | 0 | 0 | 40 | 33 | 45 | 4 | 2 | 1 |
| South Atlantic States: | | | | | | | | |
| Delaware | 0 | 0 | 9 | 7 | 0 | 0 | 0 | 2 |
| Maryland [2] | 0 | 0 | 91 | 56 | 0 | 0 | 7 | 9 |
| District of Columbia [3] | 0 | 0 | 46 | 12 | 0 | 0 | 1 | 0 |
| Virginia [3] | 0 | 0 | 23 | 23 | 0 | 0 | 7 | 9 |
| West Virginia | 0 | 0 | 56 | 63 | 0 | 0 | 9 | 6 |
| North Carolina [2] | 18 | 1 | 16 | 17 | 0 | 0 | 6 | 2 |
| South Carolina | 0 | 0 | 4 | 1 | 0 | 1 | 17 | 15 |
| Georgia [4] | 3 | 0 | | 2 | 1 | 1 | 17 | 26 |
| Florida | 0 | 0 | 2 | | 0 | 0 | 8 | 3 |
| East South Central States: | | | | | | | | |
| Kentucky | 0 | 0 | 29 | 32 | 0 | 0 | 2 | 4 |
| Tennessee | 0 | 0 | 9 | 20 | 0 | 0 | 5 | 3 |
| Alabama [4] | 1 | 1 | 8 | 5 | 0 | 0 | 9 | 8 |
| Mississippi [2] | 0 | 0 | 6 | 6 | 0 | 0 | 4 | 8 |

See footnotes at end of table.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 25, 1935, and May 26, 1934*—Continued

| Division and State | Poliomyelitis | | Scarlet fever | | Smallpox | | Typhoid fever | |
|---|---|---|---|---|---|---|---|---|
| | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 | Week ended May 25, 1935 | Week ended May 26, 1934 |
| West South Central States: | | | | | | | | |
| Arkansas | 0 | 0 | 7 | ------- | 0 | 2 | 7 | 2 |
| Louisiana | 2 | 0 | 5 | 8 | 0 | 0 | 10 | 12 |
| Oklahoma [5] | 1 | 1 | ------- | 5 | 2 | 4 | 0 | 5 |
| Texas [4] | 0 | 0 | 26 | 42 | 8 | 35 | 9 | 13 |
| Mountain States: | | | | | | | | |
| Montana [3] | 0 | 0 | 9 | 5 | 12 | 4 | 0 | 2 |
| Idaho | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Wyoming [3] | 0 | 0 | 20 | 1 | 2 | 5 | 0 | 0 |
| Colorado | 0 | 0 | 124 | 21 | 3 | 4 | 1 | 3 |
| New Mexico | 0 | 0 | 11 | 11 | 0 | 0 | 1 | 5 |
| Arizona | 1 | 2 | 31 | 13 | 0 | 0 | 3 | 19 |
| Utah [2] | 0 | 0 | 108 | 2 | 0 | 0 | 0 | 0 |
| Pacific States: | | | | | | | | |
| Washington | 0 | 0 | 55 | 73 | 39 | 0 | 1 | 1 |
| Oregon [3] | 0 | 2 | 22 | 32 | 1 | 2 | 2 | 3 |
| California | 6 | 92 | 235 | 174 | 16 | 2 | 5 | 16 |
| Total | 38 | 118 | 6,494 | 4,769 | 203 | 109 | 179 | 232 |
| First 21 weeks of year | 516 | 592 | 149,363 | 124,262 | 3,931 | 3,137 | 2,911 | 3,468 |

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended May 25, 1935, 24 cases, as follows: District of Columbia, 1; Virginia, 1; North Carolina, 1; Montana, 7; Wyoming, 10; Oregon, 4.
[4] Typhus fever, week ended May 25, 1935, 15 cases, as follows: Georgia, 9; Alabama, 5; Texas, 1.
[5] Exclusive of Oklahoma City and Tulsa.

## SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

| State | Meningococcus meningitis | Diphtheria | Influenza | Malaria | Measles | Pellagra | Poliomyelitis | Scarlet fever | Smallpox | Typhoid fever |
|---|---|---|---|---|---|---|---|---|---|---|
| *February 1935* | | | | | | | | | | |
| North Dakota | ------- | 31 | 155 | ------- | 364 | ------- | 0 | 256 | 5 | 1 |
| *March 1935* | | | | | | | | | | |
| North Dakota | 4 | 23 | 63 | ------- | 437 | ------- | 0 | 499 | 3 | 1 |
| *April 1935* | | | | | | | | | | |
| Alabama | 14 | 42 | 351 | 264 | 1,483 | 52 | 2 | 30 | 15 | 16 |
| Arizona | 5 | 7 | 101 | 1 | 240 | 1 | 1 | 227 | 9 | 5 |
| District of Columbia | 26 | 80 | 8 | ------- | 291 | ------- | 1 | 368 | 0 | 1 |
| Kansas | 6 | 41 | 39 | ------- | 5,437 | ------- | 4 | 310 | 90 | 8 |
| Louisiana | 2 | 84 | 144 | 60 | 390 | 9 | 5 | 32 | 4 | 78 |
| Montana | 4 | 42 | 304 | ------- | 2,166 | ------- | 0 | 28 | 30 | 2 |
| North Dakota | ------- | 8 | 29 | ------- | 102 | ------- | 0 | 228 | 3 | 1 |
| Pennsylvania | 27 | ------- | ------- | ------- | 21,945 | 1 | 2 | 3,062 | 0 | 30 |
| Virginia | 30 | 53 | 390 | 8 | 2,952 | 5 | 0 | 153 | 2 | 15 |
| Wisconsin | 11 | 11 | 126 | ------- | 6,804 | ------- | 2 | 1,699 | 74 | 6 |

*February 1935*

| North Dakota: | Cases |
|---|---|
| Chicken pox | 146 |
| Mumps | 6 |
| Vincent's infection | 2 |
| Whooping cough | 48 |

*March 1935*

| North Dakota: | |
|---|---|
| Chicken pox | 106 |
| Mumps | 14 |
| Septic sore throat | 1 |
| Vincent's infection | 1 |
| Whooping cough | 19 |

*April 1935*

| | |
|---|---|
| Anthrax: | |
| Pennsylvania | 1 |
| Botulism: | |
| Montana | 4 |
| Chicken pox: | |
| Alabama | 197 |
| Arizona | 57 |
| District of Columbia | 251 |
| Kansas | 367 |
| Louisiana | 38 |
| Montana | 169 |
| North Dakota | 86 |
| Pennsylvania | 3,788 |
| Virginia | 377 |
| Wisconsin | 1,417 |
| Dysentery: | |
| Arizona | 5 |
| Louisiana (amoebic) | 7 |
| Louisiana (bacillary) | 2 |
| Virginia (amoebic) | 1 |
| Virginia (diarrhea included) | 50 |
| Epidemic encephalitis: | |
| Alabama | 1 |
| District of Columbia | 2 |
| Kansas | 18 |
| Montana | 1 |
| Pennsylvania | 7 |
| Wisconsin | 3 |
| Food poisoning: | |
| Montana | 1 |

*April 1935*—Continued

| German measles: | Cases |
|---|---|
| Alabama | 32 |
| Arizona | 199 |
| Kansas | 3,589 |
| Montana | 1,291 |
| Pennsylvania | 5,932 |
| Wisconsin | 10,547 |
| Hookworm disease: | |
| Louisiana | 31 |
| Impetigo contagiosa: | |
| Kansas | 2 |
| Montana | 1 |
| Leprosy: | |
| Louisiana | 1 |
| Mumps: | |
| Alabama | 122 |
| Arizona | 134 |
| Kansas | 622 |
| Louisiana | 9 |
| Montana | 265 |
| North Dakota | 41 |
| Pennsylvania | 4,431 |
| Virginia | 299 |
| Wisconsin | 1,782 |
| Ophthalmia neonatorum: | |
| Alabama | 2 |
| Pennsylvania | 9 |
| Virginia | 1 |
| Paratyphoid fever: | |
| Kansas | 1 |
| Louisiana | 2 |
| Virginia | 2 |
| Puerperal septicemia: | |
| Montana | 1 |
| Rabies in animals: | |
| Alabama | 99 |
| Kansas | 8 |
| Louisiana | 33 |
| Rabies in man: | |
| Alabama | 1 |
| Rocky Mountain spotted fever: | |
| Montana | 11 |
| Scabies: | |
| Kansas | 10 |
| Montana | 5 |

*April 1935*—Continued

| Septic sore throat: | Cases |
|---|---|
| Kansas | 9 |
| Louisiana | 2 |
| Montana | 17 |
| Virginia | 3 |
| Wisconsin | 8 |
| Tetanus: | |
| Alabama | 7 |
| Kansas | 1 |
| Virginia | 2 |
| Trachoma: | |
| Arizona | 36 |
| Montana | 4 |
| Pennsylvania | 1 |
| Trichinosis: | |
| Pennsylvania | 1 |
| Tularaemia: | |
| Alabama | 5 |
| Kansas | 2 |
| Louisiana | 7 |
| Montana | 1 |
| Pennsylvania | 1 |
| Virginia | 3 |
| Typhus fever: | |
| Alabama | 3 |
| Louisiana | 2 |
| Undulant fever: | |
| Alabama | 3 |
| Kansas | 1 |
| Louisiana | 5 |
| Montana | 1 |
| Pennsylvania | 4 |
| Virginia | 1 |
| Wisconsin | 3 |
| Vincents infection: | |
| Kansas | 3 |
| Montana | 1 |
| North Dakota | 4 |
| Whooping cough: | |
| Alabama | 210 |
| Arizona | 82 |
| District of Columbia | 19 |
| Kansas | 318 |
| Louisiana | 18 |
| Montana | 174 |
| North Dakota | 24 |
| Pennsylvania | 1,397 |
| Virginia | 289 |
| Wisconsin | 811 |

## PLAGUE-INFECTED GROUND SQUIRREL IN MODOC COUNTY, CALIF.

The Director of Public Health of California reports that a ground squirrel from a ranch 15 miles west and 4 miles south of Alturas, Modoc County, Calif., has been proved positive for plague. The squirrel was received at the laboratory May 15, 1935.

## WEEKLY REPORTS FROM CITIES

*City reports for week ended May 18, 1935*

[This table summarizes the reports received regularly from a selected list of 121 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference]

| State and city | Diphtheria cases | Influenza | | Measles cases | Pneumonia deaths | Scarlet fever cases | Smallpox cases | Tuberculosis deaths | Typhoid fever cases | Whooping cough cases | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cases | Deaths | | | | | | | | |
| Maine: | | | | | | | | | | | |
| Portland | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 7 | 29 |
| New Hampshire: | | | | | | | | | | | |
| Concord | 0 | ---- | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| Manchester | 0 | ---- | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 8 |
| Nashua | 0 | ---- | ---- | 0 | ---- | 1 | 0 | ---- | 0 | 0 | ---- |
| Vermont: | | | | | | | | | | | |
| Barre | 0 | ---- | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| Burlington | 0 | ---- | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 0 | 6 |
| Massachusetts: | | | | | | | | | | | |
| Boston | 3 | ---- | 1 | 73 | 31 | 50 | 0 | 9 | 0 | 26 | 225 |
| Fall River | 0 | ---- | 0 | 4 | 3 | 9 | 0 | 1 | 0 | 2 | 34 |
| Springfield | 0 | ---- | 0 | 95 | 4 | 25 | 0 | 0 | 0 | 3 | 29 |
| Worcester | 0 | ---- | 0 | 5 | 10 | 0 | 0 | 2 | 6 | 4 | 58 |
| Rhode Island: | | | | | | | | | | | |
| Pawtucket | 0 | ---- | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| Providence | 2 | ---- | 1 | 414 | 5 | 15 | 0 | 1 | 0 | 6 | 59 |
| Connecticut: | | | | | | | | | | | |
| Bridgeport | 0 | ---- | 0 | 6 | 0 | 6 | 0 | 1 | 1 | 2 | 28 |
| Hartford | 0 | ---- | 0 | 15 | 1 | 18 | 0 | 10 | 0 | 12 | ---- |
| New Haven | 0 | ---- | 0 | 291 | 1 | 1 | 0 | 0 | 0 | 0 | 48 |
| New York: | | | | | | | | | | | |
| Buffalo | 1 | ---- | 0 | 47 | 14 | 72 | 0 | 12 | 0 | 31 | 124 |
| New York | 27 | 8 | 6 | 1,499 | 121 | 581 | 0 | 105 | 4 | 164 | 1,581 |
| Rochester | 0 | ---- | 0 | 131 | 9 | 25 | 0 | 3 | 0 | 32 | 83 |
| Syracuse | 0 | ---- | 0 | 468 | 2 | 24 | 0 | 0 | 0 | 31 | 46 |
| New Jersey: | | | | | | | | | | | |
| Camden | 3 | ---- | 0 | 2 | 0 | 5 | 0 | 1 | 0 | 6 | 19 |
| Newark | 0 | 5 | 0 | 543 | 11 | 13 | 0 | 13 | 0 | 68 | 89 |
| Trenton | 1 | ---- | 0 | 4 | 3 | 4 | 0 | 5 | 0 | 0 | 33 |
| Pennsylvania: | | | | | | | | | | | |
| Philadelphia | 10 | 6 | 2 | 107 | 32 | 94 | 0 | 21 | 1 | 81 | 474 |
| Pittsburgh | 2 | 4 | 3 | 326 | 17 | 38 | 0 | 8 | 0 | 19 | 156 |
| Reading | 0 | ---- | 1 | 119 | 2 | 6 | 0 | 0 | 0 | 4 | 30 |
| Scranton | 0 | ---- | ---- | 6 | ---- | 1 | 0 | ---- | 0 | 4 | ---- |
| Ohio: | | | | | | | | | | | |
| Cincinnati | 5 | ---- | 0 | 11 | 11 | 13 | 0 | 5 | 0 | 3 | 143 |
| Cleveland | 6 | 20 | 2 | 346 | 18 | 58 | 0 | 10 | 1 | 19 | 201 |
| Columbus | 1 | ---- | 0 | 124 | 7 | 15 | 0 | 4 | 0 | 1 | 87 |
| Toledo | 0 | 1 | 0 | 166 | 8 | 14 | 0 | 6 | 0 | 5 | 77 |
| Indiana: | | | | | | | | | | | |
| Fort Wayne | 6 | ---- | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 22 |
| Indianapolis | 4 | ---- | 0 | 99 | 16 | 15 | 0 | 0 | 0 | 25 | 114 |
| South Bend | 0 | ---- | 0 | 1 | 5 | 4 | 0 | 1 | 0 | 0 | 15 |
| Terre Haute | 1 | ---- | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| Illinois: | | | | | | | | | | | |
| Chicago | 19 | 6 | 3 | 928 | 50 | 635 | 0 | 43 | 3 | 73 | 739 |
| Springfield | 1 | ---- | 0 | 18 | 2 | 7 | 0 | 0 | 0 | 3 | 18 |
| Michigan: | | | | | | | | | | | |
| Detroit | 5 | 3 | 0 | 1,407 | 31 | 152 | 0 | 18 | 1 | 131 | 288 |
| Flint | 0 | ---- | 0 | 4 | 4 | 13 | 0 | 1 | 0 | 5 | 26 |
| Grand Rapids | 0 | ---- | 0 | 0 | 4 | 24 | 0 | 0 | 0 | 17 | 38 |
| Wisconsin: | | | | | | | | | | | |
| Kenosha | 0 | ---- | 0 | 15 | 2 | 10 | 0 | 0 | 0 | 5 | 4 |
| Milwaukee | 0 | ---- | 1 | 287 | 5 | 90 | 0 | 4 | 0 | 32 | 99 |
| Racine | 0 | ---- | 0 | 116 | 0 | 22 | 0 | 0 | 0 | 10 | 14 |
| Superior | 0 | ---- | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 13 |
| Minnesota: | | | | | | | | | | | |
| Duluth | 0 | ---- | 0 | 105 | 1 | 6 | 0 | 0 | 0 | 0 | 13 |
| Minneapolis | 4 | ---- | 0 | 57 | 3 | 112 | 0 | 1 | 0 | 24 | 76 |
| St. Paul | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Iowa: | | | | | | | | | | | |
| Davenport | 0 | ---- | ---- | 0 | ---- | 1 | 0 | ---- | 0 | 0 | ---- |
| Des Moines | 2 | ---- | 0 | 164 | 0 | 2 | 0 | 0 | 0 | 0 | 33 |
| Sioux City | 1 | ---- | ---- | ---- | ---- | 0 | 0 | ---- | 0 | 2 | ---- |
| Waterloo | 1 | ---- | ---- | 4 | ---- | 6 | 0 | ---- | 0 | 0 | ---- |
| Missouri: | | | | | | | | | | | |
| Kansas City | 3 | ---- | 0 | 42 | 6 | 8 | 0 | 3 | 0 | 3 | 86 |
| St. Joseph | 0 | ---- | 0 | 15 | 8 | 4 | 0 | 0 | 0 | 1 | 28 |
| St. Louis | 12 | ---- | 0 | 23 | 10 | 7 | 0 | 11 | 0 | 13 | 179 |

*City reports for week ended May 18, 1935*—Continued

| State and city | Diphtheria cases | Influenza | | Measles cases | Pneumonia deaths | Scarlet fever cases | Smallpox cases | Tuberculosis deaths | Typhoid fever cases | Whooping cough cases | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cases | Deaths | | | | | | | | |
| North Dakota: | | | | | | | | | | | |
| Fargo | 1 | | 0 | 1 | 2 | 11 | 0 | 0 | 0 | 2 | 10 |
| Grand Forks | 0 | | | 0 | | 1 | 1 | | 0 | 0 | |
| South Dakota: | | | | | | | | | | | |
| Aberdeen | 0 | | | 11 | | 0 | 0 | | 0 | 3 | |
| Nebraska: | | | | | | | | | | | |
| Omaha | 3 | | 0 | 50 | 8 | 10 | 1 | 0 | 0 | 0 | 55 |
| Kansas: | | | | | | | | | | | |
| Topeka | | | | | | | | | | | |
| Wichita | 0 | | 0 | 78 | 5 | 2 | 0 | 1 | 1 | 1 | 22 |
| Delaware: | | | | | | | | | | | |
| Wilmington | 2 | | 0 | 6 | 3 | 7 | 0 | 0 | 0 | 2 | 22 |
| Maryland: | | | | | | | | | | | |
| Baltimore | 4 | 1 | 1 | 35 | 25 | 50 | 0 | 14 | 1 | 54 | 214 |
| Cumberland | 0 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 13 |
| Frederick | 0 | | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| Dist. of Columbia: | | | | | | | | | | | |
| Washington | 10 | | 0 | 49 | 16 | 43 | 0 | 10 | 0 | 1 | 150 |
| Virginia: | | | | | | | | | | | |
| Lynchburg | 0 | | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 12 | 5 |
| Norfolk | 0 | | 0 | 4 | 3 | 0 | 0 | 2 | 0 | 4 | 35 |
| Richmond | 0 | | 0 | 35 | 5 | 0 | 0 | 5 | 0 | 0 | 58 |
| Roanoke | 1 | | 0 | 17 | 3 | 1 | 0 | 1 | 0 | 0 | 16 |
| West Virginia: | | | | | | | | | | | |
| Charleston | 1 | 1 | 1 | 6 | 1 | 0 | 0 | 0 | 0 | 1 | 23 |
| Huntington | 0 | | | 10 | | 3 | 0 | | 0 | 0 | |
| Wheeling | 0 | | 0 | 58 | 5 | 1 | 0 | 1 | 1 | 0 | 21 |
| North Carolina: | | | | | | | | | | | |
| Raleigh | 0 | | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 4 | 8 |
| Wilmington | 0 | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 15 |
| Winston-Salem | 0 | | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 9 | 14 |
| South Carolina: | | | | | | | | | | | |
| Charleston | 0 | 1 | 0 | 1 | 6 | 0 | 0 | 2 | 0 | 1 | 20 |
| Columbia | 0 | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 12 |
| Georgia: | | | | | | | | | | | |
| Atlanta | 3 | 2 | 1 | 3 | 9 | 2 | 0 | 5 | 0 | 14 | 76 |
| Brunswick | 0 | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 3 |
| Savannah | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 4 | 31 |
| Florida: | | | | | | | | | | | |
| Miami | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 4 | 2 | 1 | 29 |
| Tampa | 0 | | 0 | 11 | 0 | 0 | 0 | 1 | 0 | 1 | 25 |
| Kentucky: | | | | | | | | | | | |
| Ashland | 1 | | | 12 | | 0 | 0 | | 0 | 0 | |
| Lexington | 1 | | 0 | 12 | 5 | 1 | 0 | 2 | 0 | 5 | 22 |
| Louisville | 4 | 1 | 0 | 169 | 5 | 7 | 0 | 2 | 0 | 10 | 91 |
| Tennessee: | | | | | | | | | | | |
| Memphis | 1 | | 1 | 2 | 8 | 2 | 0 | 9 | 1 | 4 | 96 |
| Nashville | 0 | | 0 | 1 | 2 | 3 | 0 | 3 | 1 | 0 | 32 |
| Alabama: | | | | | | | | | | | |
| Birmingham | 2 | 1 | 0 | 30 | 3 | 1 | 0 | 5 | 0 | 2 | 74 |
| Mobile | 0 | | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| Montgomery | 0 | | | 0 | | 2 | 1 | | 0 | 0 | |
| Arkansas: | | | | | | | | | | | |
| Fort Smith | 0 | | | 0 | | 0 | 0 | | 0 | 0 | |
| Little Rock | 0 | | 0 | 8 | 4 | 1 | 0 | 2 | 0 | 8 | 24 |
| Louisiana: | | | | | | | | | | | |
| New Orleans | 8 | 4 | 2 | 36 | 10 | 2 | 0 | 14 | 1 | 0 | 150 |
| Shreveport | 0 | | 0 | 3 | 5 | 0 | 0 | 3 | 0 | 0 | 32 |
| Oklahoma: | | | | | | | | | | | |
| Oklahoma City | 1 | 6 | 0 | 7 | 5 | 1 | 0 | 0 | 0 | 3 | 41 |
| Texas: | | | | | | | | | | | |
| Dallas | 2 | 2 | 2 | 1 | 9 | 1 | 1 | 6 | 0 | 1 | 53 |
| Fort Worth | 2 | | 0 | 0 | 4 | 3 | 0 | 2 | 0 | 0 | 30 |
| Galveston | 0 | | 0 | 2 | 4 | 1 | 0 | 1 | 0 | 0 | 23 |
| Houston | 10 | | 0 | 0 | 4 | 1 | 0 | 7 | 2 | 0 | 83 |
| San Antonio | 0 | | 0 | 0 | 9 | 0 | 0 | 10 | 0 | 0 | 70 |
| Montana: | | | | | | | | | | | |
| Great Falls | 0 | | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 8 | 7 |
| Helena | 0 | | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 22 | 5 |
| Missoula | 0 | | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| Idaho: | | | | | | | | | | | |
| Boise | 0 | | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 5 |
| Colorado: | | | | | | | | | | | |
| Denver | 5 | | 1 | 197 | 1 | 93 | 0 | 5 | 0 | 0 | 63 |
| Pueblo | 0 | | 0 | 46 | 0 | 3 | 0 | 0 | 0 | 4 | 7 |
| New Mexico: | | | | | | | | | | | |
| Albuquerque | 0 | | 0 | 7 | 1 | 0 | 0 | 2 | 0 | 13 | 10 |

*City reports for week ended May 18, 1935*—Continued

| State and city | Diphtheria cases | Influenza | | Measles cases | Pneumonia deaths | Scarlet fever cases | Smallpox cases | Tuberculosis deaths | Typhoid fever cases | Whooping cough cases | Deaths, all causes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cases | Deaths | | | | | | | | |
| Utah: | | | | | | | | | | | |
| Salt Lake City | 1 | ---- | 0 | 1 | 3 | 115 | 0 | 0 | 0 | 93 | 24 |
| Nevada: | | | | | | | | | | | |
| Reno | 0 | ---- | ---- | 1 | ---- | 0 | 0 | ---- | 1 | 0 | ---- |
| Washington: | | | | | | | | | | | |
| Seattle | 0 | ---- | 0 | 260 | 2 | 23 | 2 | 4 | 0 | 11 | 74 |
| Spokane | 0 | ---- | 0 | 57 | 2 | 4 | 0 | 0 | 0 | 2 | 32 |
| Tacoma | 0 | ---- | 0 | 7 | 2 | 4 | 1 | 0 | 0 | 1 | 33 |
| Oregon: | | | | | | | | | | | |
| Portland | 0 | 1 | 1 | 92 | 4 | 6 | 0 | 1 | 0 | 0 | 76 |
| Salem | 0 | 1 | ---- | 2 | ---- | 0 | 0 | ---- | 0 | 0 | ---- |
| California: | | | | | | | | | | | |
| Los Angeles | 9 | 30 | 1 | 76 | 19 | 45 | 5 | 28 | 3 | 11 | 340 |
| Sacramento | 0 | 1 | 1 | 260 | 2 | 7 | 1 | 3 | 0 | 1 | 18 |
| San Francisco | 1 | 2 | 0 | 51 | 4 | 19 | 0 | 11 | 0 | 23 | 153 |

| State and city | Meningococcus meningitis | | Poliomyelitis cases | State and city | Meningococcus meningitis | | Poliomyelitis cases |
|---|---|---|---|---|---|---|---|
| | Cases | Deaths | | | Cases | Deaths | |
| Rhode Island: | | | | District of Columbia: | | | |
| Providence | 1 | 1 | 0 | Washington | 8 | 0 | 0 |
| New York: | | | | Virginia: | | | |
| New York | 31 | 5 | 4 | Norfolk | 4 | 2 | 0 |
| Pennsylvania: | | | | North Carolina: | | | |
| Philadelphia | 2 | 1 | 0 | Raleigh | 0 | 0 | 1 |
| Pittsburgh | 2 | 1 | 0 | Winston-Salem | 1 | 1 | 0 |
| Ohio: | | | | Kentucky: | | | |
| Cincinnati | 7 | 5 | 0 | Louisville | 2 | 1 | 0 |
| Cleveland | 2 | 2 | 0 | Tennessee: | | | |
| Toledo | 0 | 1 | 0 | Memphis | 2 | 0 | 0 |
| Illinois: | | | | Arkansas: | | | |
| Chicago | 16 | 5 | 0 | Fort Smith | 1 | 0 | 0 |
| Iowa: | | | | Little Rock | 0 | 2 | 0 |
| Davenport | 1 | 0 | 0 | Louisiana: | | | |
| Sioux City | 1 | 0 | 0 | New Orleans | 0 | 0 | 1 |
| Missouri: | | | | Oklahoma: | | | |
| Kansas City | 2 | 0 | 0 | Oklahoma City | 2 | 0 | 0 |
| St. Joseph | 0 | 1 | 0 | Washington: | | | |
| St. Louis | 13 | 3 | 0 | Seattle | 1 | 0 | 0 |
| Nebraska: | | | | Spokane | 1 | 0 | 0 |
| Omaha | 1 | 0 | 0 | Oregon: | | | |
| Maryland: | | | | Portland | 1 | 0 | 0 |
| Baltimore | 7 | 2 | 0 | California: | | | |
| Cumberland | 1 | 0 | 0 | Los Angeles | 0 | 0 | 5 |

*Dengue.*—Miami, 1 case.
*Epidemic encephalitis.*—Cases: Trenton, 1; Columbus, 1; Washington, 1; Miami, 1; Seattle, 3.
*Pellagra.*—Cases: Scranton, 1; Winston-Salem, 1; Charleston, S. C., 3; Savannah, 1; Miami, 2; Birmingham, 1; New Orleans, 1.
*Typhus fever.*—Cases: New York, 2; Springfield Ill., 1; Charleston, S. C., 1; Savannah, 1; Montgomery, 1.

# FOREIGN AND INSULAR

## CANADA

*Provinces—Communicable diseases—2 weeks ended May 4, 1935.*—During the 2 weeks ended May 4, 1935, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

| Disease | Prince Edward Island | Nova Scotia | New Brunswick | Quebec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Cerebrospinal meningitis | | 2 | | 1 | 1 | | | | | 4 |
| Chicken pox | | 2 | | 344 | 324 | 66 | 32 | 15 | 96 | 879 |
| Diphtheria | | 3 | | 20 | 6 | 8 | 11 | | | 48 |
| Dysentery | | | | 6 | | | | | | 6 |
| Erysipelas | | | | 14 | 2 | 6 | 3 | 1 | 1 | 27 |
| Influenza | | 70 | 2 | 9 | 10 | 6 | | | 60 | 157 |
| Lethargic encephalitis | | | | | | 1 | | | | 1 |
| Measles | | 186 | 90 | 1,410 | 5,849 | 227 | 137 | 71 | 153 | 8,123 |
| Mumps | | 16 | 1 | | 573 | 134 | 5 | 31 | 50 | 810 |
| Pneumonia | | 17 | | | 31 | | | | 21 | 69 |
| Poliomyelitis | | | | 2 | | | | | | 2 |
| Scarlet fever | | 15 | 7 | 215 | 275 | 29 | 26 | 12 | 59 | 638 |
| Trachoma | | | | | | 2 | 3 | | 7 | 12 |
| Tuberculosis | 3 | 1 | 18 | 134 | 98 | 30 | 28 | 5 | 32 | 349 |
| Typhoid fever | | | | 30 | 8 | 1 | | | | 39 |
| Undulant fever | | | | 1 | 2 | 3 | | | 1 | 7 |
| Whooping cough | | 2 | 1 | 58 | 302 | 82 | 102 | 18 | 151 | 716 |

## CZECHOSLOVAKIA

*Communicable diseases—March 1935.*—During the month of March 1935, certain communicable diseases were reported in Czechoslovakia, as follows:

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Anthrax | 5 | | Paratyphoid fever | 3 | |
| Cerebrospinal meningitis | 22 | 6 | Poliomyelitis | 7 | 2 |
| Chicken pox | 281 | | Puerperal fever | 45 | 20 |
| Diphtheria | 2,230 | 172 | Scarlet fever | 1,704 | 25 |
| Dysentery | 31 | 5 | Trachoma | 84 | |
| Influenza | 112,797 | 199 | Typhoid fever | 220 | 29 |
| Lethargic encephalitis | 3 | 2 | Typhus fever | 52 | 1 |
| Malaria | 13 | | | | |

## JAMAICA

*Communicable diseases—4 weeks ended May 18, 1935.*—During the 4 weeks ended May 18, 1935, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

| Disease | Kingston | Other localities | Disease | Kingston | Other localities |
|---|---|---|---|---|---|
| Cerebrospinal meningitis | | 1 | Leprosy | 1 | 2 |
| Chicken pox | 22 | 28 | Poliomyelitis | 1 | |
| Diphtheria | | 1 | Puerperal fever | 5 | 15 |
| Dysentery | 4 | 6 | Tuberculosis | 38 | 96 |
| Erysipelas | | 1 | Typhoid fever | 9 | 52 |

## PUERTO RICO

*Notifiable diseases—4 weeks ended May 18, 1935.*—During the 4 weeks ended May 18, 1935, cases of certain notifiable diseases were reported in the municipalities of Puerto Rico as follows:

| Disease | Cases | Disease | Cases |
|---|---|---|---|
| Chicken pox | 167 | Ophthalmia neonatorum | 2 |
| Diphtheria | 32 | Paratyphoid fever | 1 |
| Dysentery | 16 | Scarlet fever | 1 |
| Erysipelas | 2 | Syphilis | 31 |
| Filariasis | 1 | Tetanus | 1 |
| Influenza | 10 | Tetanus, infantile | 1 |
| Malaria | 662 | Tuberculosis | 654 |
| Measles | 172 | Typhoid fever | 17 |
| Mumps | 113 | Whooping cough | 207 |

## YUGOSLAVIA

*Communicable diseases—April 1935.*—During the month of April 1935, certain communicable diseases were reported in Yugoslavia as follows:

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Anthrax | 17 | 4 | Paratyphoid fever | 2 | |
| Cerebrospinal meningitis | 15 | 8 | Scarlet fever | 177 | 4 |
| Diphtheria and croup | 403 | 40 | Sepsis | 7 | 3 |
| Dysentery | 16 | | Tetanus | 29 | 16 |
| Erysipelas | 157 | 7 | Typhoid fever | 132 | 21 |
| Influenza | 17,974 | 98 | Typhus fever | 104 | 10 |
| Measles | 949 | 10 | | | |

## CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for May 31, 1935, pp. 749-763. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued June 23, 1935, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

### Cholera

*China—Canton.*—During the week ended May 18, 1935, 1 case of cholera was reported at Canton, China.

### Plague

*Indo-China—Pnom-Penh.*—During the week ended May 18, 1935, 1 case of plague was reported at Pnom-Penh, Indo-China.

*Peru.*—Plague has been reported in Peru as follows: In the city of Lima, 2 cases with 1 death were reported during the month of March 1935 and 9 cases with 7 deaths were reported during the month of April 1935. Thirteen cases of plague with 10 deaths were also reported for the whole country of Peru during April 1935.

*Senegal—Louga Circle.*—During the period May 1–10, 1935, 1 case of plague was reported in Louga Circle, Senegal.

*United States—California.*—A report of plague-infected ground squirrels in California appears on page 804 of this issue of PUBLIC HEALTH REPORTS.

**Yellow fever**

*Togo—Sokode.*—On May 19, 1935, 1 death from yellow fever was reported at Sokode, Togo.

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