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THE NOTIFIABLE DISEASES IN THE UNITED STATES, 1935

There is presented here a summary showing the prevalence of the most important communicable diseases in 1935 as reported by the health officers of the several States and the District of Columbia. It is taken from Supplement No. 119 to the PUBLIC HEALTH REPORTS, which presents the data more in detail, giving the total for each disease by months and cases and deaths by States.

The following is a list of the diseases included in the Supplement:

Typhoid fever (1) and paratyphoid fever (2)
Typhus fever (3)
Undulant fever (5)
Smallpox (6)
Measles (7)
Scarlet fever (8)
Whooping cough (9)
Diphtheria (10)
Influenza (11)
Cholera (12)
Dysentery (amoebic) (13a)
Plague (14)
Poliomyelitis (16)
Epidemic encephalitis (17)
Meningococcus meningitis (18)
Anthrax (20)
Rabies in animals
Rabies in man (21)
Tuberculosis (respiratory system and all forms) (23–32)
Syphilis (34)
Gonorrhea (35)
Yellow fever (37)
Malaria (38)
Chicken pox (44a)
Dengue (part 44c)
Mumps (part 44c)
Rocky Mountain spotted fever (part 44c)
Tularaemia (part 44c)
Pellagra (62)
Pneumonia (all forms) (107–109)
Septic sore throat (115a)

Morbidity data for 1935 were received from all the States and the District of Columbia. Mortality data were received from all States (including the District of Columbia), except New Hampshire, Ohio, and North Dakota.

The populations given and used in computing case and death rates were estimated as of July 1, 1935, by the Bureau of the Census.

The estimated expectancy, given in this summary for some of the diseases, is the result of an attempt to ascertain from the experience of recent years how many cases of the disease under consideration might be expected in 1935. It is the median number of cases reported for the years 1928 to 1934, inclusive.

In comparing the figures for 1935 with the estimated expectancy, or with reports for preceding years, it should be borne in mind that there has been a gradual improvement in the reporting of notifiable

(Figures in parentheses refer to International List of Causes of Death.)

diseases. An increase in the number of cases reported may be due in some instances to better reporting of the particular disease rather than to an increase in the number of cases occurring.

SUMMARY OF NOTIFIABLE DISEASES IN THE UNITED STATES, 1935

TYPHOID FEVER (1) AND PARATYPHOID FEVER (2)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	17, 595
Estimated expectancy based on years 1928–34	22, 395
Cases per 1,000 inhabitants, 1935	0. 147
Cases per 1,000 inhabitants, estimated expectancy	0. 193
Deaths registered, 1935	3, 325
Deaths per 1,000 inhabitants, 1935	0. 028
Cases reported for each death registered, 1935	5
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	18, 355
Cases per 1,000 inhabitants, 1935	0. 144

SMALLPOX (6)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	7, 876
Estimated expectancy based on years 1928–34	19, 919
Cases per 1,000 inhabitants, 1935	0. 066
Cases per 1,000 inhabitants, estimated expectancy	0. 171
Deaths registered, 1935	23
Deaths per 1,000 inhabitants, 1935	0. 0002
Cases reported for each death registered, 1935	342
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	7, 957
Cases per 1,000 inhabitants, 1935	0. 062

MEASLES (7)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	704, 551
Cases per 1,000 inhabitants, 1935	5. 890
Deaths registered, 1935	3, 495
Deaths per 1,000 inhabitants, 1935	0. 029
Cases reported for each death registered, 1935	202
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	743, 856
Cases per 1,000 inhabitants, 1935	5. 833

SCARLET FEVER (8)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	233, 153
Estimated expectancy based on years 1928–34	167, 675
Cases per 1,000 inhabitants, 1935	1. 949
Cases per 1,000 inhabitants, estimated expectancy	1. 443
Deaths registered, 1935	2, 355
Deaths per 1,000 inhabitants, 1935	0. 020
Cases reported for each death registered, 1935	99
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	260, 962
Cases per 1,000 inhabitants, 1935	2. 046

WHOOPING COUGH (9)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	172, 489
Estimated expectancy based on years 1928–34	168, 992
Cases per 1,000 inhabitants, 1935	1. 442
Cases per 1,000 inhabitants, estimated expectancy	1. 454
Deaths registered, 1935	4, 293
Deaths per 1,000 inhabitants, 1935	0. 036
Cases reported for each death registered, 1935	40
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	180, 518
Cases per 1,000 inhabitants, 1935	1. 416

DIPHTHERIA (10)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	36, 564
Estimated expectancy based on years 1928–34	57, 750
Cases per 1,000 inhabitants, 1935	0. 306
Cases per 1,000 inhabitants, estimated expectancy	0. 497
Deaths registered, 1935	3, 620
Deaths per 1,000 inhabitants, 1935	0. 030
Cases reported for each death registered, 1935	10
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	39, 226
Cases per 1,000 inhabitants, 1935	0. 308

[1] The District of Columbia is also included.

SUMMARY OF NOTIFIABLE DISEASES IN THE UNITED STATES, 1935—continued

INFLUENZA (11)

34 States:[1]	
Cases reported, 1935 (population 81,380,000)	191,868
Cases per 1,000 inhabitants, 1935	2.358
Deaths registered, 1935	20,712
Deaths per 1,000 inhabitants, 1935	0.255
Cases reported for each death registered, 1935	9
37 States:[1]	
Cases reported, 1935 (population 89,289,000)	195,553
Cases per 1,000 inhabitants, 1935	2.190
45 States:[1]	
Deaths registered, 1935 (population 119,612,000)	26,302
Deaths per 1,000 inhabitants, 1935	0.220

DYSENTERY (AMOEBIC) (13A)

25 States:	
Cases reported, 1935 (population 82,280,000)	1,562
Cases per 1,000 inhabitants, 1935	0.019
Deaths registered, 1935	167
Deaths per 1,000 inhabitants, 1935	0.002
Cases reported for each death registered, 1935	9
28 States:	
Cases reported, 1935 (population 94,348,000)	1,613
Cases per 1,000 inhabitants, 1935	0.017
42 States:[1]	
Deaths registered, 1935 (population 110,652,000)	242
Deaths per 1,000 inhabitants, 1935	0.002

POLIOMYELITIS (16)

45 States:[1]	
Cases reported, 1935 (population 119,612,000)	10,671
Estimated expectancy based on years 1928–34	3,610
Cases per 1,000 inhabitants, 1935	0.089
Cases per 1,000 inhabitants, estimated expectancy	0.031
Deaths registered, 1935	944
Deaths per 1,000 inhabitants, 1935	0.008
Cases reported for each death registered, 1935	11
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	10,839
Cases per 1,000 inhabitants, 1935	0.085

EPIDEMIC ENCEPHALITIS (17)

29 States:[1]	
Cases reported, 1935 (population 84,471,000)	955
Cases per 1,000 inhabitants, 1935	0.011
Deaths registered, 1935	506
Deaths per 1,000 inhabitants, 1935	0.006
Cases reported for each death registered, 1935	2
30 States:[1]	
Cases reported, 1935 (population 91,178,000)	970
Cases per 1,000 inhabitants, 1935	0.011
45 States:[1]	
Deaths registered, 1935 (population 119,612,000)	693
Deaths per 1,000 inhabitants, 1935	0.006

MENINGOCOCCUS MENINGITIS (18)

41 States:[1]	
Cases reported, 1935 (population 115,175,000)	5,237
Estimated expectancy based on years 1928–34	4,016
Cases per 1,000 inhabitants, 1935	0.046
Cases per 1,000 inhabitants, estimated expectancy	0.036
Deaths registered, 1935	2,139
Deaths per 1,000 inhabitants, 1935	0.019
Cases reported for each death registered, 1935	2
43 States:[1]	
Cases reported, 1935 (population 122,582,000)	5,736
Cases per 1,000 inhabitants, 1935	0.047
44 States:[1]	
Deaths registered, 1935 (population 117,600,000)	2,236
Deaths per 1,000 inhabitants, 1935	0.019

TUBERCULOSIS (RESPIRATORY SYSTEM) (23)

43 States:[1]	
Deaths registered, 1935 (population 115,600,000)	57,366
Deaths per 1,000 inhabitants, 1935	0.496

TUBERCULOSIS (ALL FORMS) (23–32)

45 States:[1]	
Deaths registered, 1935 (population 119,612,000)	65,237
Deaths per 1,000 inhabitants, 1935	0.545

[1] The District of Columbia is also included.

SUMMARY OF NOTIFIABLE DISEASES IN THE UNITED STATES, 1935—continued

SYPHILIS (34)

45 States:[1]	
Cases reported, 1935 (population 126,675,000)	259,314
Cases per 1,000 inhabitants, 1935	2.047

GONORRHEA (35)

45 States:[1]	
Cases reported, 1935 (population 126,675,000)	163,691
Cases per 1,000 inhabitants, 1935	1.292

MALARIA (38)

36 States:	
Cases reported, 1935 (population 108,162,000)	137,389
Cases per 1,000 inhabitants, 1935	1.270
Deaths registered, 1935	4,207
Deaths per 1,000 inhabitants, 1935	0.039
Cases reported for each death registered, 1935	33
37 States:	
Cases reported, 1935 (population 114,869,000)	137,502
Cases per 1,000 inhabitants, 1935	1.197
45 States:[1]	
Deaths registered, 1935 (population 119,612,000)	4,310
Deaths per 1,000 inhabitants, 1935	0.036

CHICKEN POX (44A)

44 States:[1]	
Cases reported, 1935 (population 113,535,000)	248,823
Estimated expectancy based on years 1928–34	210,571
Cases per 1,000 inhabitants, 1935	2.192
Cases per 1,000 inhabitants, estimated expectancy	1.909
Deaths registered, 1935	141
Deaths per 1,000 inhabitants, 1935	0.001
Cases reported for each death registered, 1935	1,765
48 States:[1]	
Cases reported, 1935 (population 127,521,000)	273,863
Cases per 1,000 inhabitants, 1935	2.148

MUMPS (PART 44C)

41 States:	
Cases reported, 1935 (population 98,073,000)	141,134
Estimated expectancy based on years 1928–34	87,447
Cases per 1,000 inhabitants, 1935	1.439
Cases per 1,000 inhabitants, estimated expectancy	0.916
Deaths registered, 1935	72
Deaths per 1,000 inhabitants, 1935	0.001
Cases reported for each death registered, 1935	1,960
45 States:	
Cases reported, 1935 (population 107,994,000)	156,656
Cases per 1,000 inhabitants, 1935	1.451
44 States:[1]	
Deaths registered, 1935 (population 117,600,000)	83
Deaths per 1,000 inhabitants, 1935	0.001

PELLAGRA (62)

45 States:[1]	
Deaths registered, 1935 (population 119,612,000)	3,438
Deaths per 1,000 inhabitants, 1935	0.029

PNEUMONIA (ALL FORMS) (107–109)

22 States:[1]	
Cases reported, 1935 (population 58,455,000)	90,114
Cases per 1,000 inhabitants, 1935	1.542
Deaths registered, 1935	47,655
Deaths per 1,000 inhabitants, 1935	0.815
Cases reported for each death registered, 1935	2
44 States:[1]	
Deaths registered, 1935 (population 115,237,000)	94,436
Deaths per 1,000 inhabitants, 1935	0.819

SEPTIC SORE THROAT (115A)

25 States:	
Cases reported, 1935 (population 57,833,000)	4,127
Cases per 1,000 inhabitants, 1935	0.071
Deaths registered, 1935	763
Deaths per 1,000 inhabitants, 1935	0.013
Cases reported for each death registered, 1935	5
32 States:	
Cases reported, 1935 (population 79,305,000)	7,206
Cases per 1,000 inhabitants, 1935	0.091
39 States:[1]	
Deaths registered, 1935 (population 95,684,000)	1,985
Deaths per 1,000 inhabitants, 1935	0.021

[1] The District of Columbia is also included.

RESISTANCE OF VARIOUS STRAINS OF E. TYPHI AND COLI AEROGENES TO CHLORINE AND CHLORAMINE[1]

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From the time of the meeting in 1895 (1) of the first committee appointed by the American Public Health Association to investigate water bacteriology, continuous attempt at improvement of the bacteriological methods of examination of water has been made. Since 1905 (2) when the first "Standard Methods of Water Analysis" was issued by the American Public Health Association, *B. coli* has been used as an indicator of the bacteriological condition of a water supply. In 1912 (3), 1917 (4), 1920 (5), 1923 (6), 1925 (7), and 1933 (8), new editions, with various changes, were issued. In 1914 the United States Treasury Department, in first establishing standards for drinking and culinary water supplied by common carriers in interstate commerce, included a section relating to bacteriological quality which establishes the allowable limits of impurity as measured by the concentration of organisms of the *B.* (*Escherichia*) *coli* group. Since 1925 the standards have also included sections relating to the source and protection, and to physical and chemical characteristics. There is still a great diversity of opinion among workers as to the media most suitable for demonstration of the *coli-aerogenes* group. There is also much argument as to whether present tests are sufficiently sensitive. In early work, dextrose broth, as well as other media, was used. In the 1912 edition of "Standard Methods" lactose bile broth was recommended as the medium of choice in case only one medium was used for the presumptive test for *B. coli*. In this same edition, methods of isolating *B. typhosus* from water are given, but these were removed in the next edition. At present the official medium for the presumptive test for *coli-aerogenes* is lactose broth, using 48 hours' incubation. It is of interest that Norton, at the 1929 (9) session of the American Public Health Association, stated that "*B. coli* may be completely killed in 48 hours in lactose broth media." This statement indicates the possibility that members of the *coli-aerogenes* group may be present in a water although the presumptive test may fail to demonstrate their presence. Winslow (10) and others have suggested that lactose bile broth and lactose broth both be used for the presumptive test. Other workers feel that the amount of water should be markedly increased over the present total of 50 cc.

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[1] This work was done under the direction of Dr. O. McDaniel, Director, Division of Preventable Diseases, and Mr. H. A. Whittaker, Director, Division of Sanitation, Minnesota State Department of Health.

Space does not permit the giving of more than a few salient points in the early development of knowledge which led to the use of *B. coli* as a means of indicating the bacteriological safety of water.

The difficulty of isolating *B. typhosus* from water was early realized. Laws and Andrewes (11), 1894, failed to isolate this organism from London sewage. Difficulty was also encountered in isolating the organisms from polluted wells by Kübler and Neufeld (12), 1899, Fischer and Flatau (13), 1901. Jordan, Russell, and Zeit (14), 1904, showed that *B. typhosus* placed in colloidin sacs in the Chicago River and Lake Michigan lived only a few days. It was also shown experimentally by Franklin (15), 1894, that the number of *B. typhosus* is rapidly reduced in water. Jordan (16), 1895, showed that *B. typhosus* gradually died out in a potable water, while *B. coli* at first multiplied rapidly and lived as a rule much longer. However, it is of interest that Jordan found that when the typhoid strain with which he worked was recently isolated, it lived as long as 93 days in potable water, whereas its viability dropped gradually after being in artificial media, until at 13 months it lived only about 12 to 13 days. In distilled water, freshly isolated *B. typhosus* lived only 18 days at the longest. *B. coli* lived as long as 262 days in potable water, but there was variation in the different strains, some strains being viable only a little longer than freshly isolated *B. typhosus*. This work which showed clearly the much greater viability of recently isolated in comparison to old typhosus strains has apparently been neglected.

Even before any of the above work, Smith (17), 1892, suggested a plan to the New York State Board of Health for estimation of colon bacilli in water. Early studies of significance also were those of the Massachusetts State Board of Health, 1898 (18), 1899 (19), 1900 (20), and 1901 (21), Clark and Gage (22), 1900, and Jordan (23), 1901. By 1903–4 the significance of *B. coli* in drinking water was quite well established. The statement of Prescott and Winslow (24), in 1904, in their book "Elements of Water Bacteriology", seems to voice the general opinion of that day: "Altogether the evidence is quite conclusive that the absence of *B. coli* demonstrates the harmlessness of a water as far as bacteriology can prove it. That when present, its numbers form a reasonably close index of the amount of pollution." They cited several authors whose investigations seemed to prove the point of the above quotation "beyond reasonable cavil."

When disinfectants began to be used in treating water supplies it was apparently considered that *B. coli* was more resistant to various chemicals than were the pathogenic intestinal bacteria. However, there is very little information in the literature on this subject. Wesbrook, Whittaker, and Mohler (25), in 1910, studied the resistance of six strains of *B. typhosus* and *B. coli* to calcium hypochlorite. The *B. coli* and *B. typhosus* strains had been from 1 month to approximately 18 months on artificial media. Mississippi River water, rendered bacteria-free by passage through a filter, was used as a menstruum. Varying amounts of hypochlorite solution were added to the suspension of bacteria in water kept at room temperature during the experimental work. Agar plates were made at set intervals and incubated at 37° C. for 24 hours, and counts were made. These investigators found that different amounts of chemicals were required to sterilize different cultures and strains of both colon and typhoid bacilli. In 2 out of 12 experiments more chemical was required to produce sterility in the *typhosus* than in the *coli* suspension. The minimum amount of chemical required in the minimum time tested for *B. coli* was from 1.5 to 3+ P. P. M., for *B. typhosus* from 1 to 3 parts per million of available chlorine. The authors were of the opinion that their results indicated in a very general way that the use of the presence or absence of *B. coli* in a water supply as a guide to the possible presence or absence of typhoid infection might be warranted pending the formulation of better technical methods. They recommended further investigation "to determine the effect of the variable factors responsible for variations in efficiency of sterilization procedures" and suggested that "the final check, however, on the value of the colon test in water disinfection will be the epidemiological data collected on typhoid infected water supplies before and after treatment."

Tonney, Greer, and Danforth (26), 1928, and Tonney, Greer, Frank, and Liebig (27), 1930, studied the minimal "Chlorine death points" of 503 vegetative and spore-bearing strains of bacteria (48 species) among which were 21 strains of *B. typhosus*, 33 of *B. coli*, and 41 of *B. aerogenes*. The authors do not give a history of the strains used or any idea of how long they had been on artificial media. Using distilled water as a menstruum, they found that exposure for 15 to 30 seconds to 0.1 P. P. M. chlorine was sufficient to kill all the *B. typhosus*, while 13 strains of *B. coli* were killed by 0.15 P. P. M., 10 strains by 0.20 P. P. M., and 9 strains by 0.25 P. P. M. of chlorine when exposed for the same period of time. The results with *B. aerogenes* were similar to those with *B. coli*. They concluded: "The experiments appear to furnish a satisfactory theoretical basis for the current practice of relying on the consistent destruction of *B. coli* in water as a criterion of effective chlorination." Griffin (28), 1934, states that 99 percent or more of *B. coli* in average water are killed within 15 minutes, and that for a given time of contact chloramine residuals two times greater than chlorine residuals will accomplish approximately the same results. Beard and Kendall (29), 1935, state: "At all organic loads the chloramine sterilization was better in 30 minutes than chlorine sterilization in 60 minutes." The apparent lack of agreement as to the relative killing power of chlorine and chloramine is as yet unexplained. Possibly it is explainable on the basis of the difference in the chemical characteristics of the water used, the peculiarities of the organisms involved, or other similar factors.

Since there is little, if any, comparative data on the resistance of freshly isolated and older strains of *B. typhosus* and *coli-aerogenes* to the modern disinfectants used in the treatment of water supplies, employing city water as the diluent, the study [2] of this question seemed warranted. Some experimental data on this problem is reported below.

The authors wish to here state that nothing in this paper should be interpreted to mean that any bacteriological test is sufficient in itself as a criterion of safety of a water supply.

MATERIALS AND METHODS

The majority of the bacterial cultures used in this study were recently isolated local strains. A few were old laboratory strains which had been grown on artificial media for a number of years. The identification number, date of isolation, material from which isolated, and the duration of the patient's clinical condition at the time when the various strains were isolated are presented in the accompanying key.

The water used in the experiments to determine the killing power of chloramine was drawn from widely separated taps on the distribution system of the municipal water supply. Portions from different taps were mixed when necessary to obtain the desired chlorine residual. Only a negligible amount of nitrites, iron, or magnesium was present in any of the samples. The pH of the various waters ranged from 6.4 to 7.4.

In the preliminary experiments, the killing power of chloramine was determined at room temperature, in three chlorine residual ranges for only one organism at a time. For each day's experiment 400 cc of each water sample was placed in three sterile 500-cc Erlenmeyer flasks, respectively. A portion of a 24-hour broth culture of either *E. typhosa* or a member of the *coli-aerogenes* group was then added to each of the three flasks. The initial number of the bacteria in the resulting suspension ranged from 80 to 850 per cc. At the end of 5, 15, and 30 minutes, and 1, 1½, 2, and 18 hours, two 1-cc portions were removed from each flask and plated in brom-cresol purple lactose agar. The plates were incubated at 37° C. for 48 hours, at the end of which time the colonies were counted. The residual chlorine concentration was determined by the ortho-tolidine method at the beginning and at intervals throughout the course of the experiment.

[2] This study was suggested in the course of an investigation of a typhoid fever epidemic in Minneapolis, Minn., during the summer of 1935, the investigation having been made possible through special grant by the State Executive Council.

Key to bacterial strains used in the experiments to determine the killing power of chloramine and chlorine for E. typhosa and the coli-aerogenes group

	Organism	Ident. no.	Organism isolated: Date 1935	Organism isolated: From—	Duration of patient's clinical condition when specimen was collected
	E. typhosa	1679	July 25	Feces	44 days.
		1727	July 26	Urine	8 days.
		1560	July 30	do	42 days.
		2537	Sept. 6	Feces	47 days. (Same patient as 1727.)
		S23	Sept. 9	do	Carrier. No history of typhoid.
		2623	Sept. 10	do	27 days. Same patient.
		S83	Sept. 19	do	36 days. Same patient.
		S129	Oct. 2	do	Carrier. No history of typhoid.
		3080	Oct. 5	do	35 days.
		3539	Oct. 26	do	34 days.
		S209	Nov. 8	do	66 days.
		3802	Nov. 12	do	14 days.
		M711	Nov. 18	Bl. culture	21 days.
		T5, old laboratory strain, in this division since 1913.			
		Rawlings old laboratory strain.			
Coli-aerogenes group	*E. communior* (Bergey).	1835	July 28	Urine	Routine stool and urine examination.
		S37	Sept. 10	Feces	Do.
		S49	Sept. 13	do	Do.
		S55	do	do	Do.
		2839	Sept. 23	do	Do.
	E. coli (Bergey)	S217	Nov. 8	Feces	Routine stool and urine examination.
	Coli-aerogenes intermediates.[1]	47994A	July 7	Tap water	Routine water examination.
		48451A	July 29	do	Do.
		48609A	Aug. 5	do	Do.
		48769A	Aug. 10	do	Do.
		49565C	Aug. 22	do	Do.
		49816B	Aug. 27	do	Do.
	E. communior	Coli	Old laboratory strain (about 1931).		

[1] Physical and biochemical characteristics of the *coli-aerogenes* intermediate group:

Ident. no.	Gram.	Motil.	Dext.	Lact.	Sacc.	Man.	Indol.	Citrate	Met. red	Vog.-pros.	E. M. B.
47994A	−	+	A. G.	A. G.	A. G.	A. G.	−	+	+	−	Atypical.
48451A	−	−	A. G.	A. G.	A. G.	A. G.	+	+	+	−	Do.
48609A	−	−	A. G.	A. G.	A. G.	A. G.	+	+	+	−	Do.
48769A	−	−	A. G.	A. G.	A. G.	A. G.	+	−	+	−	Typical.
49565C	−	−	A. G.	A. G.	A. G.	A. G.	+	+	+	−	Do.
49816B	−	+	A. G.	A. G.	A. G.	A. G.	−	+	+	−	Do.

In the later experiments the killing power of chloramine was determined for a strain of *E. typhosa* and a member of the *coli-aerogenes* group simultaneously, both at room temperature and at that of iced water. In this series of experiments two ranges of chlorine residual were studied together. The following description applies to one chlorine residual range, since the two ranges were treated identically: For each day's experiment, 400 cc of the water was placed in each of four sterile 500-cc Erlenmeyer flasks. Two flasks were allowed to remain at room temperature and two were placed in iced water. One of the flasks at room temperature and one in the iced water were inoculated with a portion of a 24-hour broth culture of *E. typhosa*. The other two flasks were inoculated with a portion of a 24-hour broth culture of a member of the *coli-aerogenes* group. The initial concentration of bacteria in the water suspensions was usually between 150 and 350 per cc. At 30-minute intervals up to 2½ hours, and again at the end of 18 hours, two 1-cc portions were withdrawn from each flask and plated in brom-cresol purple lactose agar. The plates were incubated and counted as previously described. The chlorine residuals were determined as before.

The water for the experiments to determine the disinfecting action of chlorine was collected from the combined filter effluent at one of the city filtration plants. This water had been prechlorinated, but no ammonia had been added. The water was treated by one of two methods: One method consisted of a preliminary treatment with concentrated chlorine water (700 p. p. m.) in an attempt to satisfy the chlorine demand, and a second treatment with chlorine the next morning 1 to 3 hours before use. In the other method a relatively large amount of concentrated chlorine water was added 2 to 4 hours before the experiment was begun. Only a trace of nitrites, iron, or magnesium was present in any of the samples. The pH values for the waters ranged from 7.0 to 7.9. This series of experiments included the simultaneous study of two bacterial strains in each of two chlorine residual ranges, and at both room temperature and that of iced water. The water was distributed into flasks and inoculated as previously described. At intervals of 5, 10, 20, and 30 minutes, and 1, 1½, 2, 2½, and 18 hours, two 1-cc portions were removed and plated. The plates were incubated and the colonies enumerated as before stated. The chlorine residuals were determined as above.

Another series of experiments included the simultaneous study of the killing power of both chloramine and chlorine for two bacterial strains at room temperature and at that of iced water. The chlorine residuals of the chloramine water and of the chlorine water were in the same range on any given day. The samples were collected and prepared as described above. The technique of the experiments was the same as that of the experiments to determine the disinfecting action of chlorine.

RESULTS

The results of the various experiments are shown in tables 1 to 4.[3]

From the results of the preliminary experiments (table 1), it will be seen that for the high chlorine residual ranges; 0.35–0.48 p. p. m., the recently isolated typhoid strains showed no colonies on the plates after an exposure of 30 minutes to 1 hour. The Rawlings strain of typhoid and the *coli-aerogenes* strains exhibited no colonies after 15 to 30 minutes' exposure.

[3] Tables not printed in the text will be found at the end of the article.—Ed.

Within the 0.18–0.25 p. p. m. chlorine residual range, the recently isolated typhoid strains showed no growth after an exposure of 1 to 1½ hours, while the Rawlings and the *coli-aerogenes* strains had no growth after an exposure of 30 minutes to 1 hour.

In the low chlorine residual range, 0.09–0.15 p. p. m., the recently isolated typhoid strains were often viable after exposure for 2 hours; however, the Rawlings and the *coli-aerogenes* strains showed no growth after 1½ hours' exposure.

The results of the experiments to determine the killing power of chloramine (table 2) show considerable variation. However, in the low chlorine residual range, 0.9–0.15 p. p. m., at room temperature, the recently isolated strains of *E. typhosa* and also the *coli-aerogenes* strains exhibited growth after exposure of from 2 to 2½ hours. Very often the *coli-aerogenes* strains showed no growth with a shorter period of exposure than did the strains of *E. typhosa.* Here again an old laboratory strain of *E. typhosa,* T5, showed no growth after a much shorter exposure, 30 minutes to 1 hour. In the chlorine residual range of 0.18–0.23 p. p. m. at room temperature the recently isolated strain of *E. typhosa* and the *coli-aerogenes* strains usually showed no growth after 1 to 1½ hours exposure. Frequently the recently isolated strains of *E. typhosa* were more resistant. The old laboratory strain of *E. typhosa,* T5, showed no growth after 1 hour's exposure. For the low residual range 0.9–0.15 p. p. m. in iced water, usually all the bacterial strains showed growth after 2½ hours' exposure. This was often true for the residual range of 0.18–0.23 p. p. m. also. In the other experiments at iced-water temperature with higher chlorine residuals there was little difference in the resistance of the strains of *E. typhosa* and those of the *coli-aerogenes* group. The thing that is at once noticeable is the much greater number of bacteria left after exposure at low temperatures than in those at room temperature.

In the results of the experiments to determine the killing power of chlorine (table 3), it will be seen that the low residual range 0.10–0.15 p. p. m. was relatively ineffective throughout. There were many more bacteria surviving after exposure in iced water than at room temperature. With the exception of T5, old laboratory strain of *E. typhosa,* all strains usually showed growth after 2½ hours' exposure. In the chlorine residual range of 0.18–0.25 p. p. m., exposure produces one of two results: In about one-half of the experiments the plates showed no growth when the first portion was removed for plating, after 5 to 30 minutes' exposure. This was true for all strains of *E. typhosa* and also for the *coli-aerogenes* group when exposed at both room temperature and at that of iced water. In the other half the killing power of chlorine was much less at low temperatures, and there were inconstant variations in the time required to produce sterile plates both with *E. typhosa* strains and the members of the *coli-aerogenes* group.

When the killing power of chloramine and that of chlorine were studied simultaneously, the results (table 4) were little different from those obtained separately. The chlorine reacted in one of two ways: It produced very rapid disinfection in some experiments, and in the others there was little, if any, difference in the time required by chloramine and chlorine to produce sterile plates. Often the bacterial suspensions contained viable organisms after 2½ hours' exposure, especially at low temperatures.

DISCUSSION AND SUMMARY

When the plate counts for the various periods of exposure in an experiment were plotted on semi-logarithmic paper it was found possible to project through the point representing the initial concentration a straight line which would pass through or close to practically all of the plotted points. Figure 1 shows the curve representing the killing power of chloramine (0.22 p. p. m.) for S 23 at 5° C.

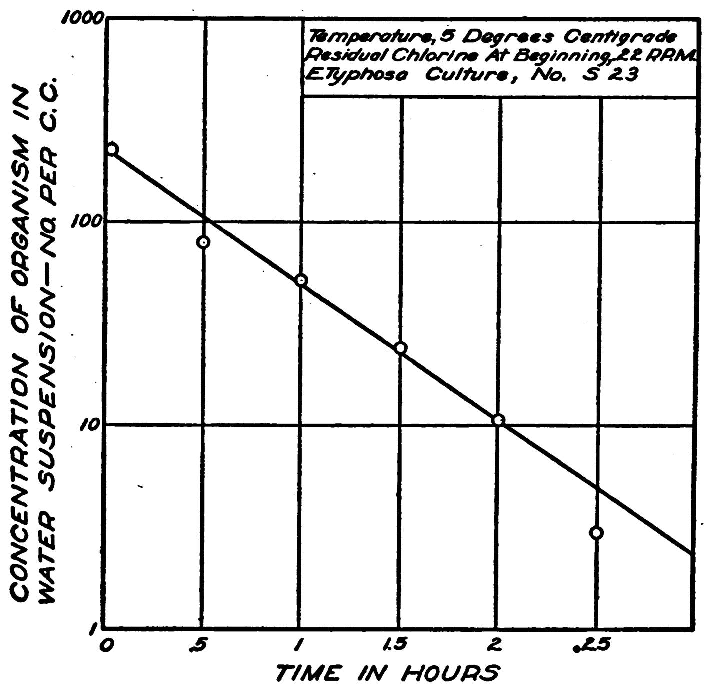

FIGURE 1.—Killing rate of chloramine

It will be seen that all the plotted points do not lie on the line drawn. However, the points lie within the zone of experimental error. From the line slope as indicated on the resulting curve, the time required to kill 99.9 percent of the bacteria was computed.

Table 5 presents a summary of the preliminary experiments, including the results of these computations, together with the physical and chemical characteristics of each water. It is shown in this table and in tables 6 and 7 that the residual chlorine was reduced during the course of the experiments. It is obvious, then, that the value of the average acting residual lies somewhere between the initial and the terminal values. Sufficient chlorine readings were made during the course of the experiments to indicate that the decrease was gradual and that time and temperature were the principal factors governing the amount of depletion.

In the preliminary experiments it was found that a longer time was required to kill recently isolated strains of *E. typhosa* than to kill the old laboratory Rawlings strain. Also by comparing the time required to kill an old laboratory strain of *E. typhosa*, T5, with the time required to kill recently isolated strains under a given set of conditions, it was found that the recently isolated strains were, in general, more resistant to the disinfecting action of chloramine. This appears to indicate that prolonged growth on artificial media materially reduces the resistance of *E. typhosa* to the disinfecting action of chloramine.

In table 8, data taken from tables 5 and 6 which illustrate the above point are summarized.

TABLE 8.—*Resistances of recently isolated and of old laboratory strains of* E. typhosa *to the disinfecting action of chloramine*

Date	Initial Cl. residual p. p. m.	Strain no. of *E. typhosa*	Hours required to kill 99.9% of organisms	
			Room temperature	Low temperature
August 19	0.09	Rawlings	1.76	
September 18	.09	2537	4.83	
October 14	.09	S83	8.94	
October 17	.10	T5	5.26	12.34
September 30	.10	2623	8.38	28.7
July 31	.10	1727	6.05	
August 14	.12	Rawlings	3.10	
September 4	.12	1727	8.48	
October 8	.13	T5	5.0	6.58
October 15	.13	S129	6.38	9.98
August 14	.22	Rawlings	.54	
July 29	.2-.25	1679	2.82	
October 8	.23	T5	.813	2.24
October 17	.23	T5	1.74	4.18
October 7	.23	3080	3.73	7.20
October 14	.23	S83	2.48	3.76
December 12	.25	3539	2.95	7.92
August 19	.35	Rawlings	.47	
September 3	.38	1560	1.76	

In table 6, which summarizes the results of experiments to determine the killing power of chloramine, it is shown that there were variations from day to day, even within the same chlorine residual and temperature ranges. These variations were to be expected, since the water used in these experiments was not a reproducible synthetic water, but rather was taken from the municipal water-supply system and consequently was subject to the variations which occur in treated surface waters.

It is interesting to note that, at room temperature, the time required to kill recently isolated strains of *E. typhosa* was, in the majority of instances (29 out of 34), equal to or in excess of the time required to kill members of the *coli-aerogenes* group studied simultaneously. However, at low temperatures a longer time was required to kill members of the *coli-aerogenes* group than to kill the *E. typhosa* strains in slightly over half the experiments (18 out of 34.) These observations seem to indicate that some strains of *E. typhosa* may, under certain conditions, exhibit as great (or greater) resistance to the killing action of chloramine as do members of the *coli-aerogenes* group.

It was also observed that there was considerable variation in the time required to kill various members of the *coli-aerogenes* group. The variation of resistance exhibited, however, could not be used as a criterion to differentiate the strains of fecal origin from those obtained from water. The time required to kill any given organism was much greater at low temperature than at room temperature, often as much as 3 to 5 times as long. The increase in time required, however, appeared to be inconstant and unpredictable.

It is clearly demonstrated in tables 6, 7, and 9 that the time required for chloramine, and in some instances chlorine, to kill strains of *E. typhosa* and members of the *coli-aerogenes* group is appreciably greater at low temperatures than at room temperature. Table 9 also shows that there is a considerable variation in the resistance of freshly isolated strains of *E. typhosa* and members of the *coli-aerogenes* group when subjected to the disinfecting action of chloramine, and that there is a possibility of viable *E. typhosa* persisting in treated waters as long as, and in some instances longer than, members of the *coli-aerogenes* group.

TABLE 9.—*Variation of resistance of certain freshly isolated strains of* E. typhosa *and members of the* coli-aerogenes *group to the disinfecting action of chloramine*

Date	Initial Cl. Residual p. p. m.	*E. typhosa* no.	*Coli-aerogenes* no.	Hours required to kill 99.9% of organisms			
				Room temperature		Low temperature	
				E. typhosa	C-A	*E. typhosa*	C-A
October 7	0.12	3080	Coli	7.95	2.15	27.1	6.35
October 1	.12	2537	S49	3.50	.884	9.98	5.23
October 15	.13	S129	48451A	6.38	3.77	9.98	6.32
September 18	.20	2537	S49	1.59	.66	5.60	.68
September 30	.20	2623	S55	2.11	1.11	6.76	3.20
December 18	.20	M711	48609A	2.82	4.6	----------	9.98
December 17	.20	S209	49816B	3.85	2.58	9.98	6.75
October 2	.22	S23	S37	1.50	1.0	4.62	6.83
October 14	.23	S83	48769A	2.48	1.72	3.76	16.6
October 15	.23	S129	48451A	2.78	1.19	6.28	1.70

A summary of the results of the experiments to determine the killing power of chlorine is presented in table 7. It is shown that chlorine in the low initial residual ranges exhibited a killing action very similar to chloramine, in that it required an hour or more to kill at room temperature, and at low temperatures the killing time was considerably lengthened. With greater initial residuals, 0.18 p. p. m. and over, about one-half of the waters studied also resembled chloramine in their action. For these waters the time required to kill members of the *coli-aerogenes* group was equal to, or in excess of, the time required to kill strains of *E. typhosa* in over one-half of the experiments—14 out of 24 at room temperature and 18 out of 26 at low temperature.

About one-half of the waters in the higher residual range, 0.18 p. p. m. and greater, killed all the bacteria before the first portions were removed for plating. That is, the strains of *E. typhosa* and members of the *coli-aerogenes* group were killed before our first plating was made. Also the bacteria were killed both at room temperature and at low temperature before the first test was made. These observed differences in action indicate the inconstancy of chlorine waters, and also the difficulties encountered in preparing them.

Table 10, which contains parts of table 7, shows that the disinfecting action of chlorine may vary considerably from day to day in a, treated water supply system, even when all controllable factors are as nearly identical as it is experimentally possible to make them.

TABLE 10.—*Variation, from day to day, of the disinfecting power of chlorine in a treated water*

Date	Initial Cl. Residual p. p. m.	E. typhosa no.	Coli-aerogenes no.	Hours required to kill 99.9 percent of organisms			
				Room temperature		Low temperature	
				E. typhosa	C-A	E. typhosa	C-A
November 6	0.10	S129	48451A	5.12	14.85	22.18	28.91
October 29	.12	S129	48451A	13.1	8.72	26.42	11.01
November 27	.12	3802	S217	6.13	11.90	8.02	16.70
November 20	.13	3802	S217	27.41	25.41	41.7	41.7
November 26	.13	M711	48609A	13.1	11.05	18.05	16.71
November 19	.13	M711	48609A	9.4	11.90	20.06	20.18
December 17	.18	S209	49816B	1.39	1.11	2.93	2.96
November 25	.20	S209	49816B	<5M	<5M	<5M	<5M
October 28	.22	S83	48769A	<30M	<30M	2.06	2.78
November 7	.23	S83	48769A	2.58	3.10	6.30	16.2

In these experiments the water used, originally a contaminated water, had been subjected to treatment (prechlorination, coagulation, sedimentation, filtration, and postchlorination with or without postammoniation) at varying periods before the organisms to be tested were added to it. It is believed, however, that this study simulates certain conditions which may be met with in a water supply system.

CONCLUSIONS

1. The disinfecting action of chlorine in treated waters is variable within limits.

2. The time required for chloramine and for chlorine in some instances to kill strains of *E. typhosa* and members of the *coli-aerogenes* group is appreciably greater at low temperatures than at room temperature.

3. There is considerable variation in the resistances of freshly isolated strains of *E. typhosa* and of members of the *coli-aerogenes* group to the disinfecting action of chlorine and chloramine.

4. Certain recently isolated strains of *E. typhosa* exhibit a greater resistance to the disinfecting action of chlorine and chloramine than do old laboratory strains which have been grown on artificial media for a number of years.

5. There is a possibility of viable *E. typhosa* persisting in waters treated with chlorine or chloramine as long as, and in some instances longer than, members of the *coli-aerogenes* group.

6. These results indicate the desirability of reconsidering the significance of the *coli-aerogenes* group as a bacteriological index of the safety of chlorinated water.

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TABLE 1.—*Results of the preliminary experiments to determine the killing power of chloramine for E. typhosa and the coli-aerogenes group*

[Minus sign (–) means "No test"]

Date	Temperature °C.	Organism	Initial number of bacteria per cc	Initial cl. residual p. p. m.	Number of bacteria per cc remaining after—							Later cl. residual, p. p. m.	
					5 min.	15 min.	30 min.	1 hr.	1½ hr.	2 hr.	18 hr.	2 hr.	18 hr.
1935													
July 29	(–)	Ty 1679	115	0.48	47	0	0	0	(–)	(–)	(–)	0.3	(–)
				.2 –.25	83	66	65	4	(–)	(–)	(–)	.08	(–)
				.05–.10	91	71	94	95	(–)	(–)	(–)	.02	(–)
Aug. 22	26–27	Ty 1679	625	.39	323	132	2	0	0	(–)	(–)	.38	(–)
				.21	378	280	120	2	0	0	(–)	.18	0
				.16	363	265	216	40	2	0	(–)	.13	0
July 31	(–)	Ty 1727	180	.4	99	2	0	0	(–)	(–)	(–)	.32	(–)
				.25	130	72	15	0	(–)	0	(–)	.16	(–)
				.10	180	150	122	48	(–)	6	(–)	.06	(–)
Sept. 4	22–23	Ty 1727	333	.38	234	151	6	0	0	(–)	(–)	.34	(–)
				.23	266	175	78	0	0	0	0	.20	0
				.12	277	234	229	148	92	41	0	.12	0
Aug. 20	25–27	Ty 1560	820	.38	144	81	6	0	0	(–)	(–)	.35	(–)
				.27	170	90	64	3	0	0	0	.18	0
				.12	190	190	145	82	64	16	0	.10	0
Sept. 3	22–23	Ty 1560	265	.38	222	101	0	0	0	(–)	(–)	.37	(–)
				.25	229	169	108	0	0	0	0	.25	.17
				.15	285	255	203	127	42	5	0	.13	.03
Aug. 14	29–31	Ty Rawlings	220	.4	30	0	0	0	0	0	(–)	.35	(–)
				.22	115	4	0	0	0	0	0	.17	0
				.12	182	83	7	1	0	0	0	.08	0
Aug. 19	25–27	Ty Rawlings	80	.35	19	2	0	0	0	0	(–)	.3	(–)
				.18	31	8	3	0	0	0	0	.12	0
				.09	30	25	7	2	0	0	0	.04	0
Aug. 13	28–29	C–A 1835	370	.4	221	4	0	0	0	0	(–)	.33	(–)
				.2	370	75	10	0	0	0	0	.18	.02
				.12	370	271	88	2	0	0	0	.08	.01
Aug. 21	25.5–27.5	C–A 1835	850	.38	348	13	0	0	0	(–)	(–)	.33	(–)
				.22	246	43	2	0	0	0	0	.20	.03
				.10	335	310	160	10	0	0	0	.06	0
Aug. 6	27–28	C–A 47994A	350	.35	183	2	1	0	0	0	(–)	.30	(–)
				.22	295	73	2	0	0	0	(–)	.17	(–)
				.14	280	165	20	1	0	0	(–)	.10	(–)

TABLE 2.—*Results of experiments to determine the killing power of chloramine for E. typhosa and the coli-aerogenes group*

[Minus sign (–) means "no test"]

Date	Temperature ° C.	Organism	Initial number of bacteria per cc	Initial cl. residual p. p. m.	Number of bacteria per cc remaining after—						Later cl. residual p. p. m.	
					30 min.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	2½ hr.	18 hr.
1935 Oct. 9	20–25	Ty S 129	210	0.13	192	108	37	5	[1] 2	0	0.13	0.045
				.23	34	0	0	0	0	0	.20	.055
		C-A 48451A	150	.13	82	55	25	19	7	0	.10	.05
				.23	5	0	0	0	0	0	.20	.05
	1–8	Ty S 129	210	.13	(–)	(–)	(–)	(–)	(–)	(–)	.12	.05
				.23	(–)	(–)	(–)	(–)	(–)	(–)	.18	.16
		C-A 48451A	150	.13	66	41	35	21	17	0	.10	.05
				.23	35	22	2	[1] 1	0	0	.18	.15
15	19–24	Ty S 129	326	.13	228	165	194	23	15	0	.08	.03
				.23	96	7	0	0	0	0	.23	.10
		C-A 48451A	162	[1] .13	67	25	3	1	0	0	.08	.03
				.23	10	0	0	0	0	0	.20	.07
	2–9	Ty S 129	245	.13	210	162	164	123	89	0	.09	.06
				.23	130	81	62	25	[1] 1	0	.23	.18
		C-A 48451A	122	.13	58	42	25	13	12	0	.08	.05
				.23	17	2	0	0	0	0	.20	.20
10	19–23	Ty S 83	493	.18	168	39	0	0	0	0	.18	.03
				.18	165	9	0	0	0	0	.18	.05
		C-A 48769A	594	.18	163	7	[1] 3	0	0	0	.17	.04
				.18	125	3	0	0	0	0	.17	.03
	3–5	Ty S 83	493	.18	180	150	131	142	94	0	.17	.12
				.18	184	90	125	86	43	0	.18	.16
		C-A 48769A	594	.18	410	398	340	330	147	0	.18	.12
				.18	328	330	210	168	65	0	.18	.16
14	20–25	Ty S 83	324	.09	185	143	111	53	16	0	.08	.03
				.23	104	16	[1] 1	0	0	0	.23	.08
		C-A 48769A	454	.09	328	134	104	44	17	0	.08	.03
				.23	116	11	7	0	0	0	.22	.05
	3.5–4	Ty S 83	243	.08	86	40	38	36	30	0	.07	.05
				.23	37	17	9	5	[1] 1	0	.20	.18
		C-A 48769A	340	.08	300	278	215	212	195	0	.06	.05
				.23	(–)	210	190	143	98	0	.18	.17
Sept. 18	24–28	Ty 2537	642	.09	367	215	74	21	[1] 6	0	.06	.04
				.20	7	0	0	0	0	0	.18	.03
		C-A S 49	775	.09	161	40	11	2	[1] 1	0	.06	.03
				.20	1	0	0	0	0	0	.17	.05
	5–10	Ty 2537	642	.09	68	56	28	20	10	0	.06	.05
				.20	26	12	2	0	0	0	.17	.15
		C-A S 49	775	.09	20	16	3	2	2	0	.05	.05
				.20	4	0	0	0	0	0	.17	.15
Oct. 1	22–24.5	Ty 2537	704	.12	165	102	27	[1] 1	0	0	.10	.05
				.20	127	5	0	0	0	0	.18	.05
		C-A S 49	1,335	.12	137	7	[1] 2	0	0	0	.10	.04
				.20	13	0	0	0	0	0	.18	.05
	2–6	Ty 2537	704	.12	211	209	156	152	137	0	.09	.08
				.20	185	141	116	77	31	0	.16	.15
		C-A S 49	1,335	.12	445	450	388	358	334	0	.08	.07
				.20	384	327	193	126	54	0	.18	.15
Sept. 25	23.5–27	Ty S 23	456	.06	365	216	148	102	39	[1] 3	.02	.03
				.15	110	2	0	0	0	0	.07	.01
		C-A S 37	309	.06	214	35	6	5	0	0	.04	.01
				.15	4	0	0	0	0	0	.06	.01
	7–9	Ty S 23	456	.06	259	312	260	280	249	0	.03	.01
				.15	336	160	77	29	[1] 2	0	.10	.01
		C-A S 37	309	.06	237	212	196	174	111	0	.03	.03
				.15	196	40	0	0	0	0	.10	.01
Oct. 2	22–25	Ty S 23	226	.15	82	12	[1] 2	0	0	0	.12	.03
				.22	39	0	0	0	0	0	.17	.04
		C-A S 37	205	.15	15	0	0	0	0	0	.10	.03
				.22	4	0	0	0	0	0	.15	.04
	3–7	Ty S 23	226	.15	62	60	44	22	10	0	.13	.07
				.22	80	51	24	11	[1] 3	0	.18	.13
		C-A S 37	205	.15	176	(–)	70	30	9	0	.13	.09
				.22	157	75	15	4	[1] 1	0	.17	.13
Sept. 30	23–24	Ty 2623	537	.1	315	243	150	101	64	0	.05	.03
				.2	97	0	0	0	0	0	.15	.03
		C-A S 55	514	.1	207	75	17	6	0	0	.06	.03
				.2	5	0	0	0	0	0	.15	.03
		Ty 2623	537	.1	441	352	305	252	227	0	.06	(–)
				.2	278	216	142	71	51	0	.20	(–)
	4–9	C-A S 55	514	.1	378	312	248	182	175	0	.05	.03
				.2	204	58	4	[1] 1	0	0	.15	.15

[1] Colony identified by specific agglutination and biochemical reactions.

Table 2.—*Results of experiments to determine the killing power of chloramine for E. typhosa and the coli-aerogenes group*—Continued

[Minus sign (−) means "no test"]

Date	Temperature °C.	Organism	Initial number of bacteria per cc	Initial cl. residual p. p. m.	Number of bacteria per cc remaining after— 30 min.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	Later cl. residual p. p. m. 2½ hr.	18 hr.
1935 Oct. 7	22–26	Ty 3080	329	0.12	267	165	133	64	13	0	0.08	0.05
				.23	132	0	0	0	0	0	.23	.10
		C–A lab. str.	414	.12	90	1	[1] 1	[1] 1	[1] 1	0	.08	.03
				.23	[1] 1	0	0	0	0	0	.18	.08
	2–8	Ty 3080	329	.12	284	180	169	190	167	0	.07	.08
				.23	215	127	98	54	12	0	.17	.20
		C–A lab. str.	414	.12	192	124	85	60	32	0	.07	.07
				.23	95	15	4	0	0	0	.17	.20
16	22.5–24	Ty 3080	268	.13	137	97	49	26	6	0	.10	.04
				.23	58	16	0	0	0	0	.20	.09
		C–A lab. str.	289	.13	125	10	1	0	0	0	.08	.04
				.23	12	1	0	0	0	0	.20	.09
	2.5–3	Ty 3080	201	.13	107	89	70	63	52	0	.10	(−)
				.23	65	41	25	17	6	0	.18	.20
		C–A lab. str.	217	.13	160	170	180	129	101	0	.10	.09
				.23	143	126	90	51	17	0	.18	.20
8	19–24	Ty T 5	283	.13	176	13	0	0	0	0	.10	.04
				.23	3	0	0	0	0	0	.23	.10
		C–A 2839	377	.13	244	27	0	0	0	0	.08	.03
				.23	4	0	0	0	0	0	.18	.07
	2–7	Ty T 5	283	.13	116	66	48	32	8	0	.08	.08
				.23	61	13	0	0	0	0	.18	.18
		C–A 2839	377	.13	295	230	205	168	104	0	.08	.08
				.23	220	90	16	[1] 1	0	0	.15	.18
17	17–24.5	Ty T 5	224	.10	124	61	12	[1] 1	0	0	.07	.03
				.23	30	0	0	0	0	0	.23	.05
		C–A 2839	374	.10	205	87	26	7	2	0	.07	.03
				.23	48	0	0	0	0	0	.20	.05
	2.5–6	Ty T 5	112	.10	73	50	42	35	17	0	.07	.04
				.23	46	12	[1] 1	0	0	0	.23	.20
		C–A 2839	187	.10	135	130	126	103	98	0	.07	.03
				.23	108	87	58	25	9	0	.23	.17
23	2.5–6	Ty S 129	253	.30	84	5	3	[1] 1	0	0	.30	.20
		C–A 48451A	128	.30	49	19	15	10	0	0	.30	.20
		Ty S 83	247	.30	48	36	25	12	3	0	.30	.20
		C–A 48769A	270	.30	156	107	63	40	9	0	.30	.20
24	2–6	Ty 3080	275	.30	60	46	20	7	[1] 2	0	.30	.20
		C–A lab. str.	377	.30	186	103	44	4	1	0	.30	----
		T 5	168	.30	63	20	8	0	0	0	.30	.20
		C–A 2839	468	.30	245	178	122	51	23	0	.30	.20

[1] Colony identified by specific agglutination and biochemical reactions.

Table 3.—*Results of experiments to determine the killing power of chlorine for E. typhosa and the coli-aerogenes group*

[Minus sign (−) means "no test"]

Date	Temperature °C.	Organism	Initial number of bacteria per cc	Initial cl. residual p. p. m.	Number of bacteria per cc remaining after— 5 min.	10 min.	20 min.	½ hr.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	Later cl. residual, p. p. m. 1 hr.	2½ hr.	18 hr.
1935 Nov. 19	22–22.5	Ty M 711	176	0.13	(−)	(−)	(−)	101	99	88	84	26	0	(−)	0.07	0
				.15	114	60	6	3	0	(−)	(−)	(−)	(−)	0.13	----	----
		C–A 48609A	186	.13	(−)	(−)	(−)	146	103	23	3	1	0	----	.07	0
				.15	142	98	24	5	0	(−)	(−)	(−)	(−)	.13	----	----
		Ty M 711	176	.13	(−)	(−)	(−)	130	109	93	95	84	0	----	.09	.05
				.15	89	71	32	23	[1] 4	(−)	(−)	(−)	(−)	.13	----	----
	5–1.5	C–A 48609A	186	.13	(−)	(−)	(−)	148	104	100	79	51	0	----	.09	.05
				.15	160	108	47	5	0	(−)	(−)	(−)	(−)	.13	----	----

Table 3.—*Results of experiments to determine the killing power of chlorine for E. typhosa and the coli-aerogenes group*—Continued

[Minus sign (–) means "no test"]

Date	Temperature ° C.	Organism	Initial number of bacteria per cc	Initial cl. residual p. p. m.	Number of bacteria per cc remaining after—									Later cl. residual, p. p. m.		
					5 min.	10 min.	20 min.	½ hr.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	1 hr.	2½ hr.	18 hr.
1935 Nov. 26	22–23	Ty M 711	109	0.13	(–)	(–)	(–)	79	68	36	18	13	0	0.10	0.09	0
				.30	80	45	2	0	0	(–)	(–)	(–)	(–)	.30	----	----
		C–A 48609A	119	.13	(–)	(–)	(–)	90	60	48	20	[1] 1	0	----	.05	0
				.30	97	48	2	0	0	(–)	(–)	(–)	(–)	.30	----	----
		Ty M 711	109	.13	(–)	(–)	(–)	92	67	63	50	45	0	.13	.12	.06
				.30	90	84	58	55	15	(–)	(–)	(–)	(–)	.30	----	----
	4–1	C–A 48609A	119	.13	(–)	(–)	(–)	93	84	70	57	49	0	----	.12	.06
				.30	90	84	74	65	27	(–)	(–)	(–)	(–)	.30	----	----
20	22.5	Ty 3802	280	.13	(–)	(–)	(–)	254	228	186	174	146	0	.05	.06	----
				.22	233	218	203	175	5	(–)	(–)	(–)	(–)	.20	----	----
		C–A S 217	300	.13	(–)	(–)	(–)	240	238	208	185	133	0	----	.05	0
				.22	244	237	194	115	3	(–)	(–)	(–)	(–)	.18	----	----
	3.5–1.5	Ty 3802	280	.13	(–)	(–)	(–)	265	240	236	234	213	5	.08	.08	.04
				.22	268	259	226	218	184	(–)	(–)	(–)	(–)	.18	----	----
		C–A S 217	300	.13	(–)	(–)	(–)	246	244	224	223	201	64	----	.07	.04
				.22	280	262	233	203	180	(–)	(–)	(–)	(–)	.18	----	----
27	22	Ty 3802	156	.12	(–)	(–)	(–)	107	53	26	20	14	0	.08	.06	0
				.20	123	86	59	8	0	(–)	(–)	(–)	(–)	.18	----	----
		C–A S 217	120	.12	(–)	(–)	(–)	100	68	45	24	13	0	----	.06	0
				.20	93	90	18	2	0	(–)	(–)	(–)	(–)	.18	----	----
		Ty 3802	156	.12	(–)	(–)	(–)	140	130	119	103	85	0	.09	.08	.05
				.20	132	121	89	74	63	(–)	(–)	(–)	(–)	.18	----	----
	4–2	C–A S 217	120	.12	(–)	(–)	(–)	103	86	73	71	75	0	----	.08	.05
				.20	107	99	87	87	57	(–)	(–)	(–)	(–)	.18	----	----
Oct. 28	22–24	Ty S 83	400	.14	(–)	(–)	(–)	264	79	17	4	0	0	----	.09	0
				.22	(–)	(–)	(–)	0	0	0	0	0	0	----	.18	.03
		C–A 48769A	448	.14	(–)	(–)	(–)	231	225	159	38	4	0	----	.09	.01
				.22	(–)	(–)	(–)	6	0	0	0	0	0	----	.18	.05
		Ty S 83	400	.14	(–)	(–)	(–)	278	128	72	57	28	0	----	.14	.12
				.22	(–)	(–)	(–)	76	14	[1] 1	[1] 1	0	0	----	.22	.15
	8–2	C–A 48769A	448	.14	(–)	(–)	(–)	366	320	205	210	178	0	----	.14	.13
				.22	(–)	(–)	(–)	220	71	3	[1] 2	[1] 1	0	----	.20	.18
Nov. 7	22–23	Ty S 83	261	.10	(–)	(–)	(–)	150	127	70	54	22	0	.06	.05	0
				.23	215	185	127	78	11	(–)	(–)	(–)	(–)	----	.17	----
		C–A 48769A	214	.10	(–)	(–)	(–)	177	112	68	27	18	0	.06	.04	0
				.23	168	143	101	31	3	(–)	(–)	(–)	(–)	----	.18	----
	4–1.5	Ty S 83	261	.10	(–)	(–)	(–)	242	198	117	130	138	0	.09	.08	.04
				.23	236	192	178	110	90	(–)	(–)	(–)	(–)	----	.20	----
		C–A 48769A	214	.10	(–)	(–)	(–)	166	139	118	121	132	0	.09	.08	.03
				.23	165	152	127	98	85	(–)	(–)	(–)	(–)	----	.20	----
Oct. 29	23–24	Ty S 129	380	.12	(–)	(–)	(–)	315	286	174	119	95	0	----	.06	.03
				.20	(–)	(–)	(–)	0	0	0	0	0	0	----	.13	.04
		C–A 48451A	155	.12	(–)	(–)	(–)	95	73	46	32	15	0	----	.06	.02
				.20	(–)	(–)	(–)	0	0	0	0	0	0	----	.13	.03
	2–3	Ty S 129	380	.12	(–)	(–)	(–)	356	323	275	230	150	0	----	.10	.06
				.20	(–)	(–)	(–)	0	0	0	0	0	0	----	.18	.12
		C–A 48451A	155	.12	(–)	(–)	(–)	96	73	75	53	41	0	----	.09	.06
				.20	(–)	(–)	(–)	0	0	0	0	0	0	----	.15	.09
Nov. 6	23–22	Ty S 129	281	.1	(–)	(–)	(–)	222	108	46	16	6	0	.07	.05	0
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.15	(–)	(–)
		C–A 48451A	174	.1	(–)	(–)	(–)	129	117	84	82	50	0	.07	.05	0
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.10	(–)	(–)
	4.5–2	Ty S 129	281	.1	(–)	(–)	(–)	282	223	178	155	138	0	.10	.08	.05
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.15	(–)	(–)
		C–A 48451A	174	.1	(–)	(–)	(–)	121	131	109	96	93	0	.10	.08	.05
				.2	99	80	14	5	0	(–)	(–)	(–)	(–)	.15	(–)	(–)
21	22	Ty 3539	230	.1	(–)	(–)	(–)	184	157	149	110	74	0	.07	.05	0
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.13	----	----
		C–A 49565C	256	.1	(–)	(–)	(–)	136	47	16	4	4	0	.07	.05	0
				.2	[1] 1	0	0	0	0	(–)	(–)	(–)	(–)	.13	----	----
	2–4	Ty 3539	230	.1	(–)	(–)	(–)	200	180	166	163	134	0	.09	.08	.05
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.18	----	----
		C–A 49565C	256	.1	(–)	(–)	(–)	161	148	139	102	97	0	.09	.08	(–)
				.2	0	0	0	0	0	(–)	(–)	(–)	(–)	.18	----	----

[1] Colony identified by specific agglutination and biochemical reactions.

TABLE 3.—*Results of experiments to determine the killing power of chlorine for E. typhosa and the coli-aerogenes group*—Continued

[Minus sign (−) means "no test"]

Date	Temperature °C.	Organism	Initial number of bacteria per cc	Initial cl residual, p. p. m.	Number of bacteria per cc remaining after—									Later cl residual, p. p. m.		
					5 min.	10 min.	20 min.	½ hr.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	1 hr.	2½ hr.	18 hr.
1935 Oct. 30	23–24	Ty 3080	355	0.12	(−)	(−)	(−)	224	199	182	111	64	0	0.12	0.07	0.03
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.18	.12	.05
		C-A lab. str	396	.12	(−)	(−)	(−)	304	266	265	204	174	2	.12	.07	.03
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.18	.10	.03
	4.5–2.5	Ty 3080	355	.12	(−)	(−)	(−)	279	210	204	163	161	0	.10	.10	.06
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.17	.18	.10
		C-A lab. str	396	.12	(−)	(−)	(−)	331	320	305	286	245	0	.10	.10	.07
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.17	.17	.10
Nov. 5	22–21	Ty 3080	188	.13	(−)	(−)	(−)	58	7	0	0	0	0	.11	.12	.06
				.28	(−)	20	7	0	0	(−)	(−)	(−)	(−)	.28	----	----
		C-A lab. str	234	.13	(−)	(−)	(−)	96	5	0	0	0	0	----	.12	.06
				.28	115	58	1	0	0	(−)	(−)	(−)	(−)	.28	----	----
	6–2	Ty 3080	188	.13	(−)	(−)	(−)	113	78	53	26	24	0	.13	.13	.09
				.28	118	67	38	25	9	(−)	(−)	(−)	(−)	.25	----	----
Oct. 31	23	C-A lab. str	234	.13	(−)	(−)	(−)	184	135	123	117	95	0	----	.13	.10
				.28	158	131	137	88	7	(−)	(−)	(−)	(−)	.28	----	----
		Ty T5	296	.10	(−)	(−)	(−)	220	218	190	147	98	0	.08	.06	0
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.18	.13	.03
		C-A 2839	145	.10	(−)	(−)	(−)	125	107	98	82	79	0	.08	.05	0
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.18	.09	.03
	3	Ty 5	296	.10	(−)	(−)	(−)	328	233	200	185	159	[1] 1	.08	.07	.05
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.18	.16	.08
		C-A 2839	145	.10	(−)	(−)	(−)	144	114	104	103	97	5	.08	.07	.04
				.20	(−)	(−)	(−)	0	0	0	0	0	0	.16	.15	.09
Nov. 4	22	Ty 5	248	.15	(−)	(−)	(−)	75	20	0	0	0	0	.15	.15	.05
				.18	(−)	0	0	0	0	0	0	0	0	.17	.17	.05
		C-A 2839	283	.15	(−)	(−)	(−)	105	46	11	[1] 2	0	0	----	.15	.05
				.18	(−)	0	0	0	0	0	0	0	0	----	.15	.04
	2.5–4.5	Ty 5	248	.15	(−)	(−)	(−)	132	117	92	81	69	0	.15	.15	.13
				.18	(−)	0	0	0	0	0	0	0	0	.18	.15	.11
		C-A 2839	283	.15	(−)	(−)	(−)	188	168	145	121	124	0	----	.15	.12
				.18	(−)	0	0	0	0	0	0	0	0	----	.17	.10
25	24–25	Ty S 209	138	.13	(−)	(−)	(−)	77	50	14	[1] 1	0	0	.09	.08	0
				.20	0	0	0	0	0	(−)	(−)	(−)	(−)	.13	----	----
		C-A 49816B	114	.13	(−)	(−)	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	0	----	.07	0
				.20	0	0	0	0	0	(−)	(−)	(−)	(−)	.13	----	----
	5–2	Ty S 209	138	.13	(−)	(−)	(−)	88	69	79	71	70	0	.13	.12	.03
				.20	0	0	0	0	0	(−)	(−)	(−)	(−)	.17	----	----
		C-A 49816B	114	.13	(−)	(−)	(−)	95	97	96	75	60	0	----	.10	.04
				.20	0	0	0	0	0	(−)	(−)	(−)	(−)	.17	----	----

[1] Colony identified by specific agglutination and biochemical reactions.

TABLE 4—*Results of simultaneous experiments to determine the killing power of chlorine and chloramine for E. typhosa and the coli-aerogenes group*

[Minus sign (−) means "no test"]

Date	Temperature °C.	Organism	Initial number of bacteria per cc	Initial cl residual, p. p. m.	Number of bacteria per cc remaining after—									Later cl residual, p. p. m.		
					5 min.	10 min.	20 min.	½ hr.	1 hr.	1½ hr.	2 hr.	2½ hr.	18 hr.	1 hr.	2½ hr.	18 hr.
1935 Dec. 11	22	Ty S 209	269	[1]0.30A	(−)	218	186	170	14	(−)	(−)	(−)	(−)	0.20	----	----
				[2].45C	0	0	0	0	0	(−)	(−)	(−)	(−)	.15	----	----
		C-A 49816B	259	.30A	(−)	13	2	0	0	(−)	(−)	(−)	(−)	.20	----	----
				.45C	0	0	0	0	0	(−)	(−)	(−)	(−)	.17	----	----
	5-2.5	Ty S 209	269	.30A	(−)	(−)	(−)	196	134	98	77	52	0	[3].20	0.20	0.15
				.45C	0	0	0	0	0	0	(−)	(−)	(−)	[3].20	.20	.08
		C-A 49816B	259	.30A	(−)	(−)	(−)	46	19	3	0	0	0	----	.20	----
				.45C	0	0	0	0	0	0	(−)	(−)	(−)	----	.20	.09
17	21-21.5	Ty S 209	233	.20A	(−)	(−)	167	153	15	(−)	(−)	(−)	(−)	.15	----	----
				.18C	116	79	25	12	11	(−)	(−)	(−)	(−)	.10	----	----
		C-A 49816B	251	.20A	(−)	(−)	129	65	17	(−)	(−)	(−)	(−)	.15	----	----
				.18C	172	157	25	7	3	(−)	(−)	(−)	(−)	.10	----	----
	3	Ty S 209	233	.20A	(−)	(−)	(−)	138	79	95	63	38	0	[3].17	.15	.13
				.18C	176	138	80	46	22	10	(−)	(−)	(−)	[3].14	.13	.08
		C-A 49816B	251	.20A	(−)	(−)	(−)	177	86	42	32	11	0	----	.15	.13
				.18C	181	176	115	102	22	8	(−)	(−)	(−)	----	.12	.08
12	21-22	Ty 3539	196	.25A	(−)	165	44	23	0	(−)	(−)	(−)	(−)	.25	----	----
				.30C	0	0	0	0	0	(−)	(−)	(−)	(−)	.15	----	----
		C-A 49565C	265	.25A	(−)	37	5	2	0	(−)	(−)	(−)	(−)	.22	----	----
				.30C	0	0	0	0	0	(−)	(−)	(−)	(−)	.13	----	----
	2	Ty 3539	196	.25A	(−)	(−)	(−)	183	83	37	9	[4]2	0	[3].20	.20	.20
				.30C	0	0	0	0	0	0	(−)	(−)	(−)	[3].20	.20	.12
		C-A 49565C	265	.25A	(−)	(−)	(−)	130	40	12	3	0	0	----	.20	.20
				.30C	0	0	0	0	0	0	(−)	(−)	(−)	----	.20	.10
16	20-21.5	Ty 3539	209	.20A	(−)	(−)	109	43	[4]2	(−)	(−)	(−)	(−)	.18	----	----
				.20C	0	0	0	0	0	(−)	(−)	(−)	(−)	.17	----	----
		C-A 49565C	252	.20A	(−)	(−)	19	9	0	(−)	(−)	(−)	(−)	.18	----	----
				.20C	0	0	0	0	0	(−)	(−)	(−)	(−)	.15	----	----
	3-4	Ty 3539	209	.20A	(−)	(−)	(−)	146	98	39	21	8	0	[3].18	.15	.15
				.20C	0	0	0	0	0	0	0	(−)	(−)	[3].17	.13	.12
		C-A 49565C	252	.20A	(−)	(−)	(−)	130	36	25	7	[4]1	0	----	.18	.15
				.20C	0	0	0	0	0	0	0	(−)	(−)	----	.13	.12
9	23	Ty 3802	190	.30A	(−)	(−)	(−)	[4]2	0	0	(−)	(−)	(−)	.28	----	----
				.30C	126	102	42	15	0	0	(−)	(−)	(−)	.25	----	----
		C-A S217	246	.30A	(−)	(−)	(−)	1	0	0	(−)	(−)	(−)	.28	----	----
				.30C	153	35	2	3	0	0	(−)	(−)	(−)	.25	----	----
	5-1.5	Ty 3802	190	.30A	(−)	(−)	(−)	140	51	35	21	7	0	[3].28	.28	.20
				.30C	161	142	105	103	79	55	47	(−)	(−)	[3].25	.28	.18
		C-A S217	246	.30A	(−)	(−)	(−)	224	123	81	29	5	0	----	.28	.20
				.30C	210	215	199	184	144	93	40	(−)	(−)	----	.28	.20
19	20-21	Ty 3802	164	.18A	(−)	(−)	101	86	50	(−)	(−)	(−)	(−)	.15	----	----
				.15C	156	140	133	124	114	(−)	(−)	(−)	(−)	.06	----	----
		C-A S217		.18A	(−)	(−)	224	198	35	(−)	(−)	(−)	(−)	13	----	----
	3-0.5	Ty 3802	313	.15C	264	236	226	220	209	(−)	(−)	(−)	(−)	.05	----	----
			164	.18A	(−)	(−)	(−)	147	100	65	60	54	0	[3].17	.13	.08
				.15C	200	183	154	148	141	108	92	(−)	(−)	----	.12	.03
		C-A S217	313	.18A	(−)	(−)	(−)	287	265	246	232	225	0	----	.05	.07
				.15C	284	276	255	262	240	223	219	(−)	(−)	----	.06	.04
10	21-23	Ty M 711	111	.32A	(−)	62	37	15	0	(−)	(−)	(−)	(−)	.25	----	----
				.30C	(−)	84	45	38	[4]4	(−)	(−)	(−)	(−)	.25	----	----
		C-A 48609A	158	.32A	(−)	90	10	0	0	(−)	(−)	(−)	(−)	.25	----	----
				.30C	(−)	95	44	16	[4]1	(−)	(−)	(−)	(−)	.25	----	----
	2-2.5	Ty M 711	111	.32A	(−)	(−)	(−)	7	0	0	0	0	0	[5].28	.25	.20
				.30C	(−)	66	21	17	[4]1	5	6	[4]5	0	[5].25	.25	.18
		C-A 48609A	158	.32A	(−)	(−)	(−)	27	4	0	0	0	0	----	.25	.20
				.30C	(−)	101	72	54	22	13	5	0	0	----	.25	.18
18	22	Ty M 711	204	.20A	(−)	(−)	126	75	31	(−)	(−)	(−)	(−)	.15	----	----
				.25C	0	0	0	0	0	(−)	(−)	(−)	(−)	.13	----	----
		C-A 48609A	245	.20A	(−)	(−)	175	118	8	(−)	(−)	(−)	(−)	.15	----	----
				.25C	0	0	0	0	0	(−)	(−)	(−)	(−)	.13	----	----
	3-4	Ty M 711	204	.20A	(−)	(−)	(−)	([5])	([5])	([5])	([5])	([5])	([5])	([5])	[3].15	----
				.25C	0	0	0	0	0	0	0	(−)	(−)	[3].20	.15	.13
		C-A 48609A	245	.20A	(−)	(−)	(−)	185	139	92	62	26	0	----	.18	.10
				.25C	0	0	0	0	0	0	0	(−)	(−)	----	.17	.12

[1] Denotes chloramine.
[2] Denotes chlorine.
[3] Residual of control sample in order not to disturb test sample.
[4] Colony identified by specific agglutination and biochemical reactions.
[5] Flask containing sample broke

Table 5.—*Summary of the preliminary experiments to determine the killing power of chloramine for E. typhosa and the coli-aerogenes group*

[Minus sign (—) means "no test"]

Date	Organism: E. typhosa: Identification no.	Organism: E. typhosa: Age in days	Organism: C–A group: Identification no.	Organism: C–A group: Age in days	Initial cl residual, p. p. m.	pH	Temperature °C.	Cl residual after 2 hr., p. p. m.	Hours required to kill 99.9 percent of organisms: E. typhosa	Hours required to kill 99.9 percent of organisms: C–A group
1935										
Aug. 19	Rawlings	(1)	(—)	(—)	0.09	7.1	30.5	0.04	1.76	(—)
July 29	1679	4	(—)	(—)	.05–.10	(—)	(—)	.02	4.75	(—)
31	1727	5	(—)	(—)	.10	(—)	(—)	.06	6.05	(—)
Aug. 21	....	......	1835	26	.10	6.8	26.5	.06	....	6.75
14	Rawlings	(1)	(—)	(—)	.12	7.1	30	.08	3.10	(—)
13	....	......	1835	18	.12	(—)	28.5	.08	....	4.18
20	1560	21	(—)	(—)	.12	(—)	26	.10	3.88	(—)
Sept. 4	1727	40	(—)	(±)	.12	6.7	22.5	.12	8.48	(—)
Aug. 6	....	......	47994A	30	.14	(—)	27.5	.10	....	2.28
Sept. 3	1560	35	(—)	(—)	.15	6.7	22.5	.13	5.88	(—)
Aug. 22	1679	28	(—)	(—)	.16	6.7	26.4	.13	2.45	(—)
19	Rawlings	(1)	(—)	(—)	.18	7.1	26	.12	1.50	(—)
13	....	......	1835	18	.20	(—)	28.5	.18	....	1.0
22	1679	28	(—)	(—)	.21	6.9	26.4	.18	1.46	(—)
14	Rawlings	(1)	(—)	(—)	.22	7.1	30	.17	.54	(—)
6	....	......	47994A	30	.22	(—)	27.5	.17	....	1.11
21	....	......	1835	26	.22	6.7	26.5	.20	....	.59
Sept. 4	1727	40	(—)	(—)	.23	6.7	25.5	.20	2.32	(—)
July 29	1679	4	(—)	(—)	.2–.25	(—)	(—)	.08	2.82	(—)
31	1727	5	(—)	(—)	.25	(—)	(—)	.16	2.0	(—)
Sept. 3	1560	35	(—)	(—)	.25	6.7	22.5	.25	4.43	(—)
Aug. 20	1560	21	(—)	(—)	.27	(—)	26	.18	1.35	(—)
19	Rawlings	(1)	(—)	(—)	.35	7.1	30.5	.30	.47	(—)
6	....	......	47994A	30	.35	(—)	27.5	.30	....	.63
21	....	......	1835	26	.38	7.1	26.5	.33	....	.83
20	1560	21	(—)	(—)	.38	(—)	26	.35	.81	(—)
Sept. 3	1560	35	(—)	(—)	.38	6.7	22.5	.37	1.76	(—)
4	1727	40	(—)	(—)	.38	6.7	22.5	.34	1.83	(—)
Aug. 22	1679	28	(—)	(—)	.39	6.7	26.4	.38	1.72	(—)
July 31	1727	5	(—)	(—)	.40	(—)	(—)	.32	1.0	(—)
Aug. 14	Rawlings	(1)	(—)	(—)	.40	6.9	30	.35	.37	(—)
13	....	......	1835	18	.40	(—)	28.5	.33	....	1.25
July 29	1679	4	(—)	(—)	.48	(—)	(—)	.30	.6	(—)

[1] Several years.

Table 6.—*Summary of the experiments to determine the killing power of chloramine for E. typhosa and the coli-aerogenes group*

[Minus sign (—) means "no test"]

Date	Organism: E. typhosa: Identification no.	Organism: E. typhosa: Age in days	Organism: C-A group: Identification no.	Organism: C-A group: Age in days	Room temperature: Initial Cl residue, p. p. m.	Room temperature: pH	Room temperature: Temperature ° C.	Room temperature: Cl residue after 2½ hr., p. p. m.	Room temperature: Hours required to kill 99.9 percent of organisms: E. typhosa	Room temperature: Hours required to kill 99.9 percent of organisms: C-A group	Low temperature: Temperature ° C.	Low temperature: Cl residue after 2½ hr., p. p. m.	Low temperature: Hours required to kill 99.9 percent of organisms: E. typhosa	Low temperature: Hours required to kill 99.9 percent of organisms: C-A group
1935														
Sept. 25	S23	16	S37	15	0.06	6.7	25	0.02	10.28	18.45	8	0.03	28.7	20.04
18	2537	12	S49	5	.09	6.7	26	.06	4.83	2.55	7.5	.06	4.30	2.55
Oct. 14	S83	25	48769A	65	.09	7.0	22.5	.07	8.94	5.47	3.5	.07	8.05	30.0
Sept. 30	2623	20	S55	17	.10	6.7	23.5	.05	8.38	2.93	6.5	.06	28.7	30.7
Oct. 17	T5	[1] 25	2839	24	.10	7.0	21	.07	5.28	5.24	4	.07	12.34	22.8
7	3080	2	Coli	([2])	.12	6.7	24	.08	7.95	2.15	5	.08	27.1	6.35
1	2537	25	S49	18	.12	6.7	23.5	.10	3.50	.884	4	.09	9.98	5.23
16	3080	11	Coli	([2])	.13	7.1	23.5	.10	6.22	2.42	3	.10	------	20.5
9	S129	7	48451A	72	.13	6.9	22.5	.10	6.38	6.84	4.5	.12	------	6.35
15	S129	13	48451A	78	.13	7.1	21.5	.08	6.38	3.77	5.5	.09	9.98	6.32
8	T5	[1] 25	2839	15	.13	6.7	21.5	.11	5.0	4.01	4.5	.13	6.58	15.50
Sept. 25	S23	16	S37	15	.15	6.4	25	.07	2.40	.812	8	.10	4.48	3.88
Oct. 2	S23	23	S37	22	.15	6.7	23.5	.12	2.70	1.35	5	.13	5.35	6.48
10	S83	21	48769A	61	.18	6.7	21	.18	3.23	1.91	4	.18	10.55	9.00
10	S83	21	49769A	61	.18	6.7	21	.18	2.66	1.91	4	.18	7.75	19.9
Dec. 19	3802	37	S217	41	.18	7.0	20.5	[3].15	6.58	7.23	2	.13	14.04	53.5
Sept. 18	2537	12	S49	5	.20	6.7	26	.17	1.59	.66	7.5	.17	5.60	.68
Oct. 1	2537	25	S49	18	.20	6.7	23.5	.18	0.813	0.813	4	.18	2.85	4.50
Sept. 30	2623	20	S55	17	.20	6.7	23.5	.15	2.11	1.11	6.5	.20	6.76	3.20
Dec. 18	M711	30	48609A	135	.20	7.2	22	[3].15	2.82	4.6	3.5	.15	------	9.98
17	S209	39	49816B	112	.20	7.2	21.5	[3].15	3.85	2.58	3	.15	9.98	6.75
16	3539	51	49565C	116	.20	7.2	21	[3].18	2.69	1.00	3.5	.15	4.62	7.48
Oct. 2	S23	23	S37	22	.22	6.6	23.5	.17	1.50	1.00	5	.18	4.62	6.83
7	3080	2	Coli	([2])	.23	6.7	24	.18	3.73	.66	5	.17	7.20	2.21
16	3080	11	Coli	([2])	.23	6.9	23.5	.17	2.18	1.11	3	.18	5.28	10.22
9	S129	7	48451A	72	.23	6.7	22.5	.20	1.87	1.11	4.5	.18	------	2.75
14	S83	25	48769A	65	.23	6.7	22.5	.22	2.48	1.72	4	.20	3.76	18.6
8	T5	[1] 25	2839	15	.23	6.7	21.5	.18	0.813	1.11	4.5	.18	2.24	1.96
15	S129	13	48451A	78	.23	6.9	21.5	.23	2.78	1.19	5.5	.23	6.28	1.70
17	T5	[1] 25	2839	24	.23	6.9	21	.23	1.74	1.67	4	.23	4.18	6.98
Dec. 12	3539	47	49565C	112	.25	7.2	21.5	[3].25	2.95	.933	2	.20	7.92	3.55
9	3802	27	S217	31	.30	7.4	23	[3].28	1.695	1.11	3	.28	3.88	2.18
11	S209	33	49816A	106	.30	7.2	22	[3].20	6.8	2.18	4	.20	12.80	2.68
Oct. 23	S129	21	48451A	86	.30	7.2	(—)	.30	(—)	(—)	4	.30	3.25	3.82
23	S83	34	48769A	74	.30	7.2	(—)	.30	(—)	(—)	4	.30	4.43	6.92
24	3080	19	Coli	([2])	.30	(—)	(—)	.30	(—)	(—)	4	.30	4.05	4.85
24	T5	[1] 25	3839	31	.30	(—)	(—)	.30	(—)	(—)	4	.30	3.38	6.40
Dec. 10	M711	22	48609A	127	.32	7.2	22	[3].25	2.82	1.53	2.5	.25	1.26	1.91

[1] Plus years.
[2] Several years.
[3] Cl residual after 1 hour.

TABLE 7.—*Summary of the experiments to determine the killing power of chlorine for E. typhosa and the coli-aerogenes group*

Date	Organism				Room temperature						Low temperature			
	E. typhosa		C-A group		Initial Cl residual, p. p. m.	pH	Temperature °C.	Cl residual after 2½ hr., p. p. m.	Hours required to kill 99.9 percent of organisms		Temperature °C.	Cl residual after 2½ hr., p. p. m.	Hours required to kill 99.9 percent of organisms	
	Identification no.	Age in days	Identification no.	Age in days					E. typhosa	C-A group			E. typhosa	C-A group
1935														
Oct. 31	T5	[1] 25	2839	38	0.10	----	23	0.06	17.65	26.2	3	0.07	27.5	34.4
Nov. 7	S83	49	48769A	89	.10	7.5	22.5	.05	8.17	8.17	3	.08	17.05	16.2
6	S129	35	48451A	100	.10	7.5	22.5	.05	5.12	14.85	3	.08	22.18	28.91
21	3539	26	49565C	91	.10	----	22	.05	19.40	3.80	3	.08	30.98	17.1
Oct. 30	3080	25	Coli	(2)	.12	----	23.5	.07	10.87	20.38	3.5	.10	21.1	34.82
29	S129	27	48451A	92	.12	----	23.5	.06	13.1	8.72	2.5	.10	26.42	11.01
Nov. 27	3802	15	S217	19	.12	----	22	.06	6.13	11.90	3	.08	8.02	16.70
25	S209	17	49816B	90	.13	7.9	24.5	.08	4.29	2.39	3.5	.12	22.92	29.6
26	M711	10	48609A	115	.13	----	22.5	.09	13.1	11.05	2.5	.12	18.05	16.71
20	3802	8	S217	12	.13	7.8	22.5	.06	27.8	25.41	2.5	.08	41.7	41.7
19	M711	1	48609A	106	.13	7.6	22.5	.07	9.4	11.90	3	.09	20.06	20.18
5	3080	31	Coli	(2)	.13	7.5	21.5	.12	1.76	3.22	4	.13	8.73	7.84
Oct. 28	S83	40	48769A	80	.14	7.3	23	.09	3.9	9.98	5	.14	6.55	22.57
Nov. 19	M711	1	48609A	106	.15	7.6	22.5	[3] .13	.98	1.11	3	[3] .13	1.7	1.62
4	T5	[1] 25	2839	42	.15	7.3	22	.15	2.62	3.75	3.5	.15	12.38	17.10
Dec. 19	3802	37	S217	41	.15	----	20.5	[3] .06	6.86	14.05	2	.12	14.04	22.4
Nov. 4	T5	[1] 25	2839	42	.18	7.3	22	.17	<10.M	<10.M	3.5	.15	<10.M	<10.M
Dec. 17	S209	39	49816B	112	.18	7.0	21.5	[3] .10	1.39	1.11	3	.13	2.93	2.96
Nov. 25	S209	17	49816B	90	.20	7.9	24.5	[3] .13	<5.M	<5.M	3.5	[3] .17	<5.M	<5.M
Oct. 29	S129	27	48451A	92	.20	----	23.5	.13	<30.M	<30.M	2.5	.18	<30.M	<30.M
30	3080	25	Coli	(2)	.20	----	23.5	.12	<30.M	<30.M	3.5	.18	<30.M	<30.M
31	T5	[1] 25	2839	38	.20	----	23	.13	<5.M	<5.M	3	.16	<5.M	<5.M
Nov. 6	S129	35	48451A	100	.20	7.5	22.5	[3] .15	<5.M	<5.M	3	[3] .15	<5.M	1.35
21	3539	26	49565	91	.20	----	22	[3] .13	<5.M	<5.M	3	[3] .18	<5.M	<5.M
27	3802	15	S217	19	.20	----	22	[3] .18	2.14	3.78	3	[3] .18	4.54	10.42
Dec. 16	3539	51	49565C	116	.20	7.2	21	[3] .17	<5.M	<5.M	3.5	.13	<5.M	<5.M
Nov. 20	3802	8	S217	12	.22	7.9	22.5	.20	6.7	5.06	2.5	[3] .18	17.05	10.42
Oct. 28	S83	40	48769A	80	.22	7.3	23	.18	<30.M	<30.M	5	.22	2.06	2.78
Nov. 7	S83	49	48769A	89	.23	7.5	22.5	[3] .17	2.58	3.10	3	.20	6.30	16.2
Dec. 18	M711	30	48609A	135	.25	7.0	22	[3] .13	<5.M	<5.M	3.5	.15	<5.M	<5.M
Nov. 5	3080	31	Coli	(2)	.28	7.5	21.5	[3] .28	.74	.795	4	[3] .28	1.74	2.32
Dec. 9	3802	27	S217	31	.30	7.2	23	[3] .25	1.695	1.67	3	.28	6.77	10.86
Nov. 26	M711	10	48609A	115	.30	----	22.5	[3] .30	1.31	1.30	2.5	[3] .30	3.55	3.63
Dec. 10	M711	22	48609A	127	.30	7.2	22	[3] .25	2.97	1.72	2.5	.25	5.14	3.23
12	3539	47	49565C	112	.30	7.1	21.5	[3] .15	<5.M	<5.M	2	.20	<5.M	<5.M
11	S209	33	49816B	106	.45	7.4	22	[3] .15	<5.M	<5.M	4	.20	<5.M	<5.M

[1] Years, plus.
[2] Several years.
[3] Cl residual after 1 hour.

DEATHS DURING WEEK ENDED SEPT. 12, 1936

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

	Week ended Sept. 12, 1936	Corresponding week, 1935
Data from 86 large cities of the United States:		
Total deaths	6,976	6,928
Deaths per 1,000 population, annual basis	9.7	9.7
Deaths under 1 year of age	501	459
Deaths under 1 year of age per 1,000 estimated live births	45	42
Deaths per 1,000 population, annual basis, first 37 weeks of year	12.3	11.5
Data from industrial insurance companies:		
Policies in force	68,415,419	67,573,738
Number of death claims	8,880	10,767
Death claims per 1,000 policies in force, annual rate	6.8	8.3
Death claims per 1,000 policies, first 37 weeks of year, annual rate	10.1	9.8

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 Sept. 19, 1936, and Sept. 21, 1935

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept. 19, 1936, and Sept. 21, 1935

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935
New England States:								
Maine	1	2		1	8	10	3	0
New Hampshire	1				1		0	0
Vermont					3	9	0	0
Massachusetts	7	4			17	6	1	3
Rhode Island						7	0	0
Connecticut		2	2		3	9	0	0
Middle Atlantic States:								
New York [2]	18	29	[1] 2	[1] 8	36	72	4	17
New Jersey	10	10	8	2	14	19	1	3
Pennsylvania	14	25			16	30	2	3
East North Central States:								
Ohio	14	32	8	5	12	7	1	3
Indiana	15	53	7	14	2	12	1	2
Illinois	28	56	4	7	10	21	3	2
Michigan	13	6		1	14	23	1	1
Wisconsin	4	5	6	36	17	41	0	1
West North Central States:								
Minnesota	5	6		2	6	11	0	1
Iowa	2	18			3	1	0	0
Missouri	6	52	18	63		9	0	0
North Dakota		7	4	1		2	0	0
South Dakota		1			2		0	0
Nebraska	3	8			1	2	0	1
Kansas	9	5		1	1	2	0	0
South Atlantic States:								
Delaware		2		5	2	9	0	0
Maryland [3] [4]	3	8	2	3	7	5	3	3
District of Columbia	5	10					0	2
Virginia	23	35			4	8	2	2
West Virginia	5	43	2	32	2	5	4	1
North Carolina [3]	53	67		5	6	15	2	0
South Carolina [3]	27	17	94	161		2	0	0
Georgia [3]	27	34		0		0	1	0
Florida [3]	5	15	3	1		5	0	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept. 19, 1936, and Sept. 21, 1935—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935
East South Central States:								
Kentucky	11	66	—	2	13	12	3	1
Tennessee [2]	43	56	7	26	1	—	6	7
Alabama [3]	29	69	11	13	—	3	2	2
Mississippi [3]	19	29	—	—	—	—	0	0
West South Central States:								
Arkansas	7	11	—	10	—	2	0	0
Louisiana	11	32	7	8	—	9	1	1
Oklahoma [5]	10	19	16	13	1	—	1	0
Texas [2]	33	74	20	27	10	7	3	0
Mountain States:								
Montana	—	—	5	4	1	8	0	0
Idaho	—	2	1	1	—	—	0	0
Wyoming	—	—	—	—	4	14	0	0
Colorado	3	6	—	—	3	1	0	0
New Mexico	1	8	—	2	10	—	0	0
Arizona	2	—	9	3	4	—	0	0
Utah [3]	1	—	—	—	1	2	0	0
Pacific States:								
Washington	—	—	1	—	11	6	0	2
Oregon	1	—	4	11	2	36	0	0
California [2]	30	34	15	10	40	77	4	1
Total	499	953	256	478	288	519	49	59
First 38 weeks of year	17,174	21,427	142,829	105,936	271,869	698,294	6,240	4,493

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935
New England States:								
Maine	1	18	6	3	0	0	1	1
New Hampshire	0	5	3	1	0	0	0	0
Vermont	0	5	2	5	0	0	0	0
Massachusetts	1	132	43	55	0	0	4	1
Rhode Island	0	37	12	12	0	0	1	1
Connecticut	0	32	9	37	0	0	4	6
Middle Atlantic States:								
New York [2]	12	198	86	126	0	0	20	39
New Jersey	1	52	13	21	0	0	19	5
Pennsylvania	8	12	105	97	0	0	22	43
East North Central States:								
Ohio	17	3	111	122	0	0	39	35
Indiana	3	3	36	53	0	1	17	16
Illinois	48	12	96	230	4	1	26	40
Michigan	11	45	76	74	4	0	7	22
Wisconsin	4	3	68	95	1	2	4	3
West North Central States:								
Minnesota	3	6	27	64	4	1	2	13
Iowa	4	3	18	61	2	2	4	7
Missouri	4	1	25	49	0	0	23	21
North Dakota	2	4	3	18	14	1	1	6
South Dakota	0	0	9	4	0	1	0	3
Nebraska	0	1	5	13	0	0	1	2
Kansas	3	2	18	48	0	14	7	12
South Atlantic States:								
Delaware	0	0	1	2	0	0	1	1
Maryland [3] [4]	7	5	17	23	0	0	5	22
District of Columbia	0	7	8	12	0	0	0	1
Virginia	5	8	12	19	0	0	24	28
West Virginia	7	2	29	61	0	0	28	20
North Carolina [3]	1	8	48	58	0	0	28	30
South Carolina [3]	0	0	6	8	0	0	13	18
Georgia [3]	9	1	22	—	0	0	32	28
Florida [3]	1	0	4	7	0	0	0	8

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept. 19, 1936, and Sept. 21, 1935—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935	Week ended Sept. 19, 1936	Week ended Sept. 21, 1935
East South Central States:								
Kentucky	1	18	31	63	5	0	56	21
Tennessee [2]	17	4	36	48	0	0	31	38
Alabama [3]	13	0	14	18	0	0	13	28
Mississippi [3]	6	1	58	15	0	0	19	4
West South Central States:								
Arkansas	1	3	5	5	0	0	7	6
Louisiana	2	2	7	16	0	0	14	39
Oklahoma [5]	1	0	2	8	0	0	24	26
Texas [2]	5	1	27	20	0	0	28	48
Mountain States:								
Montana	0	0	11	36	5	0	16	2
Idaho	1	0	4	17	0	0	1	4
Wyoming	2	1	0	------	0	0	1	0
Colorado	8	0	12	31	3	0	2	2
New Mexico	4	1	2	2	0	0	20	18
Arizona	2	2	0	5	0	0	3	3
Utah [3]	0	0	3	21	0	0	0	1
Pacific States:								
Washington	10	0	13	23	2	4	5	3
Oregon	2	0	10	20	0	0	7	4
California [2]	15	27	88	115	0	1	20	18
Total	242	665	1,241	1,841	44	28	600	697
First 38 weeks of year	2,282	7,938	188,692	186,824	6,234	5,451	9,868	12,801

[1] New York City only.
[2] Typhus fever, week ended Sept. 19, 1936, 55 cases, as follows: New York, 1; North Carolina, 1; South Carolina, 1; Georgia, 32; Florida, 2; Tennessee, 1; Alabama, 9; Texas, 7; California, 1.
[3] Week ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended Sept. 19, 1936, Maryland, 1 case.
[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
August 1936										
Alabama	3	67	22	1,259	10	22	111	45	1	136
California	9	98	45	17	252	7	43	282	3	71
Colorado	8	11	------	------	16	------	10	54	2	10
Illinois	11	87	16	24	36	------	60	387	7	89
Maryland	10	21	4	4	74	------	1	46	0	36
Michigan	8	19	1	8	50	------	15	272	2	30
Minnesota	2	19	5	------	14	------	3	85	12	14
Mississippi	3	74	419	9,184	120	357	45	23	0	84
Nevada	1	------	3	------	------	------	0	12	0	2
New Jersey	8	22	31	5	157	------	2	74	0	44
New York	32	57	------	12	523	------	39	393	0	87
Ohio	13	50	31	11	71	------	39	279	5	75
Oklahoma [1]	1	43	34	249	25	20	1	33	0	142
South Carolina	2	159	205	1,286	24	94	3	3	0	69
Tennessee	9	71	41	322	20	26	114	50	0	212
Texas	4	121	126	4,264	107	53	4	81	2	245
West Virginia	3	41	16	------	43	------	8	58	0	58

[1] Exclusive of Oklahoma City and Tulsa.

Summary of Monthly Reports from States—Continued

August 1936

	Cases
Actinomycosis:	
California	2
Illinois	1
Chicken pox:	
Alabama	7
California	103
Colorado	25
Illinois	123
Maryland	9
Michigan	167
Minnesota	26
Mississippi	158
Nevada	3
New Jersey	66
New York	318
Ohio	133
Oklahoma [1]	3
South Carolina	9
Tennessee	4
Texas	11
West Virginia	4
Dengue:	
Alabama	2
Mississippi	7
Texas	8
Diarrhea:	
Maryland	55
Ohio (under 2 years, enteritis included)	33
South Carolina	678
Dysentery:	
Alabama (amoebic)	1
California (amoebic)	15
California (bacillary)	13
Illinois (amoebic)	9
Illinois (bacillary)	13
Illinois (amoebic carriers)	37
Maryland	33
Michigan (bacillary)	5
Minnesota (amoebic)	2
Minnesota (bacillary)	5
Mississippi (amoebic)	114
Mississippi (bacillary)	791
New Jersey (amoebic)	3
New Jersey bacillary)	5
New Jersey (unspecified)	1
New York (amoebic)	5
New York (bacillary)	29
Ohio (bacillary)	5
Oklahoma [1]	56
Tennessee (amoebic)	5
Tennessee (other forms)	123
Texas (bacillary)	28
Epidemic encephalitis:	
Alabama	1
California	10
Colorado	13
Illinois	2
Maryland	2
Michigan	5
Minnesota	1
New York	15
Ohio	2
Tennessee	3
Food poisoning:	
California	10
German measles:	
California	52
Illinois	12
Maryland	9
Michigan	58
New Jersey	29
New York	60
Ohio	17
Tennessee	1
Granuloma, coccidioidal:	
California	2
Hookworm disease:	
Mississippi	439
South Carolina	106
Tennessee	1

August 1936—Continued

	Cases
Impetigo contagiosa:	
Maryland	5
Oklahoma [1]	3
Tennessee	7
Lead poisoning:	
Illinois	3
Michigan	1
New Jersey	1
Ohio	6
Leprosy:	
California	1
Mumps:	
Alabama	54
California	567
Colorado	22
Illinois	75
Maryland	103
Michigan	124
Mississippi	255
New Jersey	209
Ohio	58
Oklahoma [1]	3
South Carolina	24
Tennessee	43
Texas	237
West Virginia	19
Ophthalmia neonatorum:	
Alabama	2
California	1
Illinois	7
Maryland	2
Mississippi	12
New Jersey	10
New York	12
Ohio	81
Oklahoma [1]	1
South Carolina	8
Tennessee	6
Paratyphoid fever:	
California	8
Colorado	1
Illinois	5
Michigan	4
Minnesota	1
New Jersey	1
New York	15
Ohio	1
South Carolina	6
Tennessee	6
Texas	15
West Virginia	1
Puerperal septicemia:	
Mississippi	27
Ohio	3
Tennessee	1
Rabies in animals:	
Alabama	82
California	65
Illinois	26
Michigan	7
Mississippi	12
New Jersey	6
New York [2]	6
South Carolina	21
Texas	8
Rabies in man:	
Illinois	3
Relapsing fever:	
California	2
Rocky Mountain spotted fever:	
Illinois	1
Maryland	4
New York	1
Septic sore throat:	
California	7
Illinois	3
Maryland	5
Michigan	18
Minnesota	1
New York	19
Ohio	70

August 1936—Continued

	Cases
Septic sore throat—Con.	
Oklahoma [1]	12
Tennessee	2
Tetanus:	
Alabama	12
California	5
Illinois	8
Maryland	3
Michigan	1
New Jersey	2
New York	10
Oklahoma [1]	1
South Carolina	2
Tennessee	1
Trachoma:	
California	13
Illinois	316
Maryland	3
Mississippi	14
Ohio	3
Oklahoma [1]	2
Tennessee	107
Trichinosis:	
California	1
Illinois	1
Michigan	1
New York	5
Tularaemia:	
California	2
Illinois	1
Maryland	1
Minnesota	1
Nevada	7
Ohio	3
Texas	4
Typhus fever:	
Alabama	79
Maryland	2
New York	4
Oklahoma [1]	1
South Carolina	1
Tennessee	1
Texas	49
Undulant fever:	
Alabama	5
California	13
Illinois	4
Maryland	7
Michigan	5
Minnesota	6
Mississippi	1
New Jersey	3
New York	17
Ohio	9
Oklahoma [1]	29
Tennessee	1
Texas	2
Vincent's infection:	
Illinois	19
Maryland	11
Michigan	18
New York [2]	61
Oklahoma [1]	1
Tennessee	12
Whooping cough:	
Alabama	24
California	739
Colorado	171
Illinois	622
Maryland	471
Michigan	927
Minnesota	125
Mississippi	146
Nevada	11
New Jersey	440
New York	988
Ohio	885
Oklahoma [1]	2
South Carolina	57
Tennessee	66
Texas	122
West Virginia	50

[1] Exclusive of Oklahoma City and Tulsa.
[2] Exclusive of New York City.

PLAGUE IN PLACER COUNTY, CALIFORNIA

Under date of September 15, 1936, Surgeon C. R. Eskey reports a human case of plague in a female patient residing at Lake Tahoe, Placer County, Calif., with onset on July 23. Positive findings for plague by culture and animal inoculation were reported by Dr. K. F. Meyer, of the Hooper Foundation for Medical Research, University of California.

WEEKLY REPORTS FROM CITIES

City reports for week ended Sept. 12, 1936

This table summarizes the reports received weekly from a selected list of 140 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	------	0	0	0	0	0	0	0	2	20
New Hampshire:											
Concord	0	------	0	0	1	3	0	0	0	0	10
Nashua	0	------	------	0	------	0	0	------	0	0	------
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	3
Burlington	0	------	0	0	0	0	0	0	0	0	5
Rutland	0	------	0	0	1	0	0	0	0	0	8
Massachusetts:											
Boston	1	------	1	5	9	13	0	8	0	63	165
Fall River	0	------	0	0	0	0	0	1	0	0	17
Springfield	0	------	0	1	0	1	0	1	0	2	30
Worcester	1	------	0	1	5	3	0	2	0	16	47
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	10
Providence	0	------	0	0	0	4	0	2	0	11	67
Connecticut:											
Bridgeport	0	------	0	2	1	1	0	0	1	0	43
Hartford	0	------	0	1	1	3	0	1	0	8	40
New Haven	0	------	0	0	0	1	0	1	1	0	43
New York:											
Buffalo	0	------	1	2	5	4	0	4	3	1	125
New York	8	7	1	22	44	29	0	76	14	98	1,153
Rochester	0	------	0	0	1	0	0	2	1	2	50
Syracuse	0	------	0	1	1	1	0	1	0	28	36
New Jersey:											
Camden	1	------	1	1	2	0	0	0	1	0	20
Newark	0	------	0	0	2	3	0	11	2	17	105
Trenton	0	------	0	0	3	0	0	0	0	5	23
Pennsylvania:											
Philadelphia	2	------	5	0	13	15	0	22	0	75	356
Pittsburgh	3	2	2	1	14	16	0	4	1	25	112
Reading	0	------	0	1	0	1	0	1	0	17	31
Scranton	1	------	------	0	---	0	0	------	1	1	------
Ohio:											
Cincinnati	1	------	1	2	5	1	0	7	0	1	125
Cleveland	0	3	0	0	7	15	0	7	2	40	149
Columbus	1	------	0	0	1	4	0	3	4	6	64
Toledo	0	------	0	2	3	11	0	2	1	17	50
Indiana:											
Anderson	0	------	0	0	2	1	0	1	1	2	9
Fort Wayne	------	------	------	------	------	------	------	------	------	------	------
Indianapolis	1	------	0	0	3	3	0	3	0	3	72
Muncie	0	------	0	0	0	0	0	0	0	0	10
South Bend	0	------	0	2	0	0	0	1	0	2	18
Terre Haute	0	------	0	0	0	3	0	0	0	0	16
Illinois:											
Alton	0	------	0	0	0	0	0	0	0	0	6
Chicago	8	1	0	0	25	34	0	28	7	73	603
Elgin	0	------	0	0	1	0	0	0	0	1	6
Moline	0	------	0	0	0	0	0	1	0	0	10
Springfield	0	------	0	0	0	0	0	1	0	0	18

City reports for week ended Sept. 12, 1936—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								
Michigan:											
Detroit	5	------	0	3	14	19	0	12	1	88	243
Flint	------	------	------	------	------	------	------	------	------	------	------
Grand Rapids	0	------	0	0	0	5	0	0	0	5	23
Wisconsin:											
Kenosha	0	------	0	0	0	4	0	1	0	1	4
Madison	0	------	0	0	1	0	0	0	0	12	11
Milwaukee	0	2	2	2	1	11	0	3	0	41	93
Racine	0	------	0	0	0	3	0	0	0	0	14
Superior	0	------	0	0	0	1	0	0	0	0	4
Minnesota:											
Duluth	0	------	0	0	2	5	0	0	0	14	20
Minneapolis	0	------	0	3	5	2	0	0	0	11	59
St. Paul	0	------	0	2	5	4	0	1	0	11	48
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	0	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	1	------	------	0	------	0	0	------	0	0	31
Sioux City	0	------	------	0	------	4	1	------	0	0	------
Waterloo	1	------	------	0	------	1	0	------	0	0	------
Missouri:											
Kansas City	1	------	0	1	3	2	0	3	0	4	94
St. Joseph	1	------	0	0	0	1	0	1	0	2	13
St. Louis	1	------	0	0	1	4	0	8	7	22	179
North Dakota:											
Fargo	0	------	0	0	0	1	0	0	0	0	6
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	0	0	1	0	0	0	0	6
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	10
Nebraska:											
Omaha	2	------	0	0	0	0	0	1	1	0	31
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	0	------
Topeka	0	------	0	0	1	0	0	1	0	0	18
Wichita	1	------	0	1	1	1	0	0	0	0	21
Delaware:											
Wilmington	0	------	0	0	0	0	0	0	0	3	21
Maryland:											
Baltimore	1	------	0	9	8	6	0	8	1	95	170
Cumberland	0	2	0	0	0	1	0	0	0	0	14
Frederick	0	------	0	0	0	0	0	0	0	0	3
District of Col.:											
Washington	9	------	0	0	5	10	0	19	1	34	153
Virginia:											
Lynchburg	3	------	0	0	0	0	0	0	3	3	13
Norfolk	0	------	0	0	1	0	0	0	0	1	30
Richmond	0	------	0	0	3	0	0	1	1	0	49
Roanoke	4	------	0	0	0	0	0	0	0	0	19
West Virginia:											
Charleston	------	------	------	------	------	------	------	------	------	------	------
Huntington	0	------	0	0	0	4	0	0	0	0	------
Wheeling	0	------	0	0	2	1	0	0	1	0	18
North Carolina:											
Gastonia	1	------	0	0	0	1	0	0	0	0	------
Raleigh	0	------	0	0	1	0	0	3	1	0	19
Wilmington	0	------	0	0	0	0	0	0	0	0	10
Winston-Salem	0	------	0	0	0	0	0	1	1	0	12
South Carolina:											
Charleston	0	2	0	0	1	0	0	0	1	0	17
Columbia	------	------	------	------	------	------	------	------	------	------	------
Florence	0	------	0	0	1	0	0	0	0	0	18
Greenville	0	------	0	0	0	0	0	0	0	0	10
Georgia:											
Atlanta	2	1	0	0	8	4	0	0	2	0	77
Brunswick	0	------	0	0	0	0	0	0	0	0	3
Savannah	0	------	0	0	3	0	0	0	2	0	25
Florida:											
Miami	0	------	0	0	1	0	0	3	0	2	29
Tampa	1	------	0	3	0	1	0	2	0	0	36
Kentucky:											
Ashland	1	------	------	0	------	0	0	1	1	0	6
Covington	0	------	0	0	0	2	0	0	0	0	14
Lexington	0	------	0	0	0	0	0	0	0	0	25
Louisville	1	------	0	0	0	2	0	2	5	12	57

City reports for week ended Sept. 12, 1936—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								
Tennessee:											
Knoxville	3	------	0	0	0	1	0	2	1	1	17
Memphis	0	------	0	0	0	1	0	5	1	0	66
Nashville	0	------	0	0	2	2	0	1	3	[illegible]	40
Alabama:											
Birmingham	2	------	0	0	5	0	0	2	8	0	49
Mobile	1	------	0	0	0	1	0	0	0	0	22
Montgomery	1	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	------	------	------	------	------	------	------	------	------	------	------
Little Rock	0	------	0	0	4	1	0	1	0	[illegible]	6
Louisiana:											
Lake Charles	0	------	1	0	0	0	0	0	0	[illegible]	6
New Orleans	2	1	1	0	5	3	0	10	2	[illegible]	126
Shreveport	0	------	0	0	6	0	0	2	0	0	45
Oklahoma:											
Tulsa	0	------	------	0	------	1	0	------	1	0	------
Texas:											
Dallas	2	------	0	1	0	2	0	0	1	1	62
Fort Worth	1	------	0	3	1	2	0	2	0	0	25
Galveston	0	------	0	0	1	1	0	0	0	0	15
Houston	9	------	1	0	6	2	0	9	2	0	76
San Antonio	2	------	0	0	5	0	0	5	0	0	58
Montana:											
Billings	1	------	0	0	0	1	0	0	0	0	4
Great Falls	0	------	0	0	1	1	0	0	0	2	7
Helena	0	------	0	0	0	1	0	0	0	0	5
Missoula	0	------	0	0	1	0	0	0	0	0	5
Idaho:											
Boise	0	------	0	0	1	0	0	1	0	0	10
Colorado:											
Colorado Springs	0	------	0	0	0	0	0	1	0	0	18
Denver	0	------	1	2	6	3	0	2	2	31	98
Pueblo	0	------	0	0	1	1	0	0	0	0	10
New Mexico:											
Albuquerque	0	------	0	0	0	1	0	4	3	0	12
Utah:											
Salt Lake City	0	------	0	0	0	4	0	1	0	6	28
Nevada:											
Reno	------	------	------	------	------	------	------	------	------	------	------
Washington:											
Seattle	0	------	0	3	2	0	0	2	1	4	81
Spokane	0	------	0	3	2	2	0	0	0	0	22
Tacoma	0	------	0	0	0	1	0	1	0	0	23
Oregon:											
Portland	0	------	0	0	5	1	0	2	4	3	83
Salem	0	------	------	0	------	0	0	------	0	1	------
California:											
Los Angeles	11	9	0	6	12	12	0	17	1	34	299
Sacramento	1	------	0	0	1	11	0	0	0	22	24
San Francisco	1	------	0	2	7	10	0	3	0	8	169

City reports for week ended Sept. 12, 1936—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Maine:				North Dakota:			
Portland	0	0	1	Fargo	0	0	1
Massachusetts:				Nebraska:			
Boston	1	0	2	Omaha	0	0	2
New York:				Maryland:			
Buffalo	1	0	0	Baltimore	2	0	0
New York	8	2	5	District of Columbia:			
Rochester	1	0	0	Washington	1	1	0
New Jersey:				Virginia:			
Newark	0	0	1	Richmond	1	1	0
Pennsylvania:				West Virginia:			
Philadelphia	0	0	1	Huntington	0	1	0
Pittsburgh	0	0	1	Kentucky:			
Ohio:				Louisville	0	1	0
Columbus	1	1	0	Tennessee:			
Toledo	0	0	2	Memphis	1	1	3
Indiana:				Knoxville	0	0	2
Indianapolis	0	0	1	Alabama:			
Illinois:				Birmingham	0	0	3
Chicago	0	2	20	Louisiana:			
Springfield	1	0	0	New Orleans	1	0	0
Michigan:				Colorado:			
Detroit	0	0	1	Denver	0	0	2
Wisconsin:				Utah:			
Milwaukee	0	0	1	Salt Lake City	0	0	1
Iowa:				Oregon:			
Davenport	0	0	1	Portland	1	0	2
Des Moines	0	0	2	California:			
Missouri:				Los Angeles	0	0	6
St. Louis	1	0	2				

Dengue.—Cases: Atlanta, 1.

Epidemic encephalitis.—Cases: Philadelphia, 1; Cumberland, 1; Denver, 2; San Francisco, 1.

Pellagra.—Cases: Philadelphia, 1; Columbus, 1; Winston-Salem, 1; Atlanta, 1; Savannah, 3; Birmingham, 1; Dallas, 1; Denver, 1; Sacramento, 1; San Francisco, 1.

Rabies in man.—Deaths: Chicago, 3.

Typhus fever.—Cases: Atlanta, 1; Savannah, 1; Birmingham, 1; Fort Worth, 1; Houston, 1; Los Angeles, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Two weeks ended September 5, 1936.—During the 2 weeks ended September 5, 1936, 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				1	5					6
Chicken pox		1			68	10	20	9	16	124
Diphtheria		1	1	21	15	5	8	7		58
Dysentery				1	7	1				9
Erysipelas				5	7	3	3	1	9	28
Influenza		2			13	5			3	23
Measles			1	63	66	25	82	44	26	307
Mumps					60	4	15	8	35	122
Paratyphoid fever		1			5					6
Pneumonia					4				4	8
Poliomyelitis			1	9	11	27	2	1	3	54
Scarlet fever	4		8	71	91	51	48	68	10	351
Trachoma						1	1			2
Tuberculosis		48	55	92	67	31	97	3	31	424
Typhoid fever			1	63	15	2	15	12	7	115
Undulant fever				1	3					4
Whooping cough		13		134	201	12	15	16	44	435

DENMARK

Communicable diseases—April, May, and June 1936.—During the months of April, May, and June 1936, cases of certain communicable diseases were reported in Denmark as follows:

Disease	April	May	June	Disease	April	May	June
Anthrax		1		Paratyphoid fever	6	10	3
Cerebrospinal meningitis	11	6	4	Poliomyelitis	8	8	8
Chicken pox	101	80	26	Puerperal fever	15	18	18
Diphtheria and croup	163	183	116	Scabies	716	549	550
Epidemic encephalitis	2	5		Scarlet fever	507	397	383
Erysipelas	285	223	177	Syphilis	81	56	56
German measles	871	759	339	Tetanus, neonatorum	1	3	4
Gonorrhea	799	741	828	Tetanus, traumatic	1		2
Influenza	13,543	9,782	4,672	Typhoid fever	4	1	8
Malaria	4	10	8	Undulant fever (Bact. abort. Bang)	62	58	73
Measles	325	341	298	Whooping cough	2,857	2,382	2,221
Mumps	891	629	467				
Paradysentery	19	18	188				

GERMANY

Bremen—Poliomyelitis.—During the period May 17 to August 22, 1936, 44 cases of poliomyelitis were reported in Bremen, Germany. During the week ended August 22, 1936, 11 cases of poliomyelitis were reported.

JAMAICA

Communicable diseases—4 weeks ended September 5, 1936.—During the 4 weeks ended September 5, 1936, 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		2	Poliomyelitis		2
Chicken pox	1	19	Puerperal septicemia		2
Diphtheria		1	Scarlet fever	2	2
Dysentery	8	14	Tuberculosis	38	79
Erysipelas		1	Typhoid fever	24	118
Leprosy	1	1			

YUGOSLAVIA

Communicable diseases—August 1936.—During the month of August 1936, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	141	14	Poliomyelitis	18	1
Cerebrospinal meningitis	6	3	Scarlet fever	340	3
Diphtheria and croup	752	65	Sepsis	8	5
Dysentery	684	80	Tetanus	62	32
Erysipelas	217	7	Typhoid fever	1,207	81
Measles	31	1	Typhus fever	16	2
Paratyphoid fever	154	4			

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 September 25, 1936, pages 1348–1361. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued October 30, 1936, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

Cholera

India—Bombay.—During the week ended September 12, 1936, 1 suspected case of cholera was reported in Bombay, India.

Plague

Argentina—Santiago del Estero Province—Isca Yacu.—During the period September 1–15, 1936, 1 case of pneumonic plague with 1 death was reported in Isca Yacu, Santiago del Estero Province, Argentina.

Egypt—Asyut Province.—During the week ended September 12, 1936, 3 cases of plague were reported in Asyut Province, Egypt.

England—Liverpool.—On September 4, 1936, 2 plague-infected rats were found on the vessel *Delambre* at Liverpool, England. The vessel came from Montevideo, Buenos Aires, Rosario, Santos, and Las Palmas.

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—Ten rats found September 17, 1936, and 5 rats found September 21, 1936, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, have been proved plague infected.

United States—California.—A report of plague in California appears on page 1392 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Mexico.—During the month of June 1936, smallpox has been reported in Mexico as follows: Aguascalientes, Aguascalientes State, 1 case; Guadalajara, Jalisco State, 7 cases, 7 deaths; Mexico, D. F., 18 cases, 2 deaths; Mexico State, 2 cases, 2 deaths; Nayarit State, 1 death; Puebla, Puebla State, 3 cases, 2 deaths; San Luis Potosi, San Luis Potosi State, 1 case.

Typhus Fever

Mexico.—During the month of June 1936, typhus fever has been reported in Mexico as follows: Aguascalientes, Aguascalientes State, 1 case; Guadalajara, Jalisco State, 1 case; Mexico, D. F., 23 cases, 18 deaths; Mexico State, 1 death; Oaxaca State, 1 case; Puebla, Puebla State, 3 cases, 2 deaths; Queretaro State, 1 case; San Luis Potosi, San Luis Potosi State, 3 cases.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Muzo, Boyaca Department, December 28, 1935, to January 4, 1936, 2 cases; January 4, to May 15, 1936, 9 deaths; Cundinamarca Department, February 11, 1936, 1 death; July 2–26, 1936, 3 deaths; Intendencia of Meta—Acacias, January 7, 1936, 1 death; Restrepo, June 4 to July 26, 1936, 6 deaths; Villavicencio, January to July 1936, 6 deaths; Santander Department, June and July 1936, 6 deaths.

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