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## PLAGUE. SULFADIAZINE TREATMENT OF GUINEA PIGS INFECTED BY ARTIFICIAL METHODS OR BY FLEA TRANSMISSION

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Reports have been made of the therapeutic value of each of several sulfonamide compounds in human cases of plague (1-8), and the results of treatment of inoculated animals with sulfanilamide, sulfapyridine, or sulfathiazole (5, 9-12). The reports of the clinical course of the disease in man when under therapy with these drugs have varied widely and a consensus regarding its efficacy does not seem to have been reached. Some of the divergence of opinion seems to arise from failure to consider its value in different stages or types of the disease. The results with experimental animals seem more consistently satisfactory, but the conditions of the experiments have been rather artificial in that the animals were inoculated subcutaneously and treatment was initiated before inoculation, contemporary with it, or at a predetermined number of hours thereafter.

The inconsistency of the results obtained in man with the different sulfa derivatives administered and the selectivity of the experimental methods used with the laboratory animals appeared to warrant further tests and a trial of sulfadiazine which is excreted more slowly than other forms of these compounds. A further stimulus to additional tests arose from the observation that the growth of *P. pestis* was inhibited when planted on 5 percent blood agar plates prepared from human blood containing 1.1 mg. percent of sulfonamide.

The experiments were designed to reproduce in guinea pigs, as closely as practicable, the course of the disease in man and to determine the therapeutic value of the drug when administered after the characteristic buboes had developed and before the occurrence of a septicemia. The bubo is a finding which can be recognized in both man and guinea pig and is the first criterion which suggests the diagnosis in many human cases.

Fifty guinea pigs were used in the tests. Twenty-six received sulfadiazine and 24 did not but were matched individually insofar as possible with a treated animal with regard to weight, general physical condition, method of inducing infection, characteristic clinical findings,

and nonspecific administrations. Twenty-two of the 24 controls died of plague; another developed enormous buboes, became thin and was febrile, but lived for 34 days after inoculation when it was killed and the infection proved bacteriologically; the other animal died of hemorrhage on the third day after inoculation without showing definite evidence of plague. Seven of the 26 treated animals died. One of these 7 showed no evidence of infection when it died 11 days after inoculation but the pelvis and ureters of the kidneys were stuffed with crystals of a sulfonamide. Another was progressing favorably toward recovery but developed an acute purulent cervical adenitis probably caused by injury from a capsule being pushed deep into its pharynx in order to assure its being swallowed.

All the animals used in the test were examined by necropsy and bacteriological methods before they were discharged, at death, or when killed after clinical recovery and survival for at least 21 days after inoculation. Among the animals which died while under treatment, it was noted that there were but few organisms obtained in preparations from their tissues, and that most of these were of involution forms in contrast to the large numbers of typical morphology obtained from the controls.

Preliminary series of animals were tested by the use of sulfathiazole; dosage was guided in frequency and amount by determination of the amount of sulfonamide which persisted in samples of heart blood withdrawn at varying periods after administration (Bratton and Marshall method). It was found difficult to maintain consistently in the blood an amount of drug which was believed necessary to accomplish good therapy. Sodium sulfadiazine was then tried and was found to effect rapidly a good blood level, but the level also declined rapidly. The treatment adopted was an initial dose of 100 mg. of sodium sulfadiazine administered subcutaneously in aqueous solution and 100 mg. of sulfadiazine given in a capsule by mouth. This dose was followed by 100-mg. capsules, by mouth, as frequently and for as long a period as seemed indicated by the course of the infection in the individual animal. All but five of the animals receiving the sulfadiazine were given sodium bicarbonate in capsules by mouth in dosage approximately double that of the drug.

Drug treatment was instituted in 25 animals after a papule had developed at the site of inoculation or flea bite with a rise of temperature to 39° C. and an unmistakable bubo had developed in one or two contiguous lymph nodes. One animal developed a papule and fever but failed to show a definite bubo.

The tests were run in parallel on a treated animal and an untreated control, with but two exceptions in each of which there were two treated animals and one untreated as the control. The inequality in

the number of controls in this test resulted from the technical difficulties of obtaining comparable animals which had been infected by flea bites on the same day.

Two groups of ten each were inoculated intracutaneously on the abdomen with suspensions of a blood agar culture of *P. pestis*, strain No. 3035, grown 24 hours at 30° C. This strain had consistently killed guinea pigs, white rats, and white mice under various experimental conditions throughout the past 2 years. Approximately 1,500 organisms were given to each of one group; 12,000 to a second group;

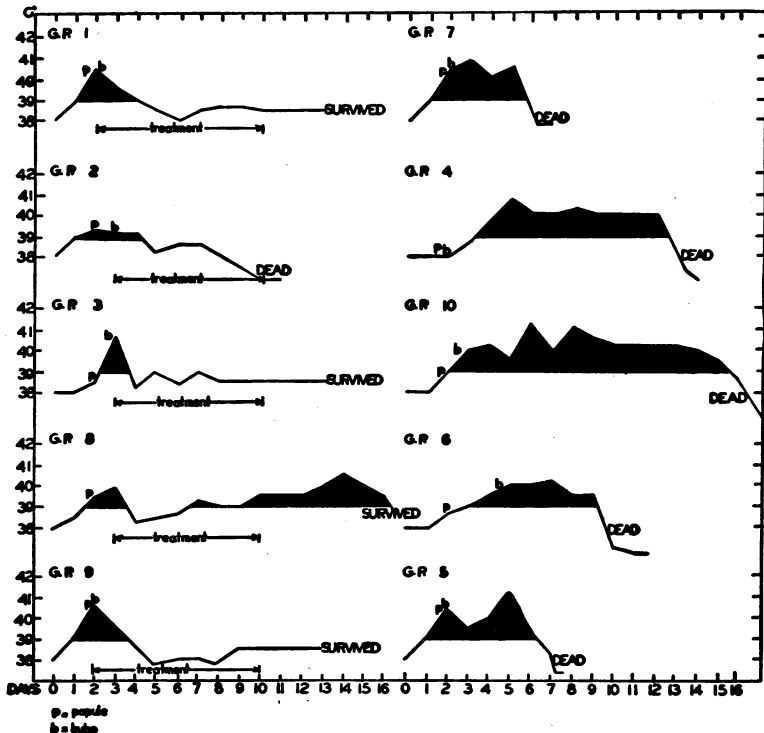


FIGURE 1.—Guinea pigs inoculated intracutaneously with  $1500 \pm P. pestis$ , strain B 3035, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and those without treatment.

and 25,000 of a recently isolated strain, D 67, to the third group. The number of organisms was determined by turbidity standards and by plating out on blood agar.

Twenty animals were infected by the bites of fleas (*Xenopsylla cheopis*) which had previously fed on guinea pigs artificially inoculated with the same strain of *P. pestis*.

Blood cultures and determinations of the drug content were made on samples of heart blood from 20 of the treated animals. A check on the drug content in the blood of 6 others was made by micro methods on blood from a vein in the foot. It was found that frequent

heart puncture and withdrawal of a sample of 2 cc. of blood weakened the animal even though dextrose-saline solution was returned intraperitoneally; hence the frequency of sampling was lessened somewhat with succeeding groups and discontinued toward the last of the series. However, among the 15 animals inoculated artificially and treated, there were cultures of 43 blood samples of which 1 was positive; among the corresponding 15 untreated controls, cultures were made of 38 samples and 14 were positive. Among 5 of the animals infected by fleas and treated, there were cultures of 4 samples, 3 of which were positive. One of these was positive before treatment began. Among the 5 untreated controls, there were 4 blood cultures and all

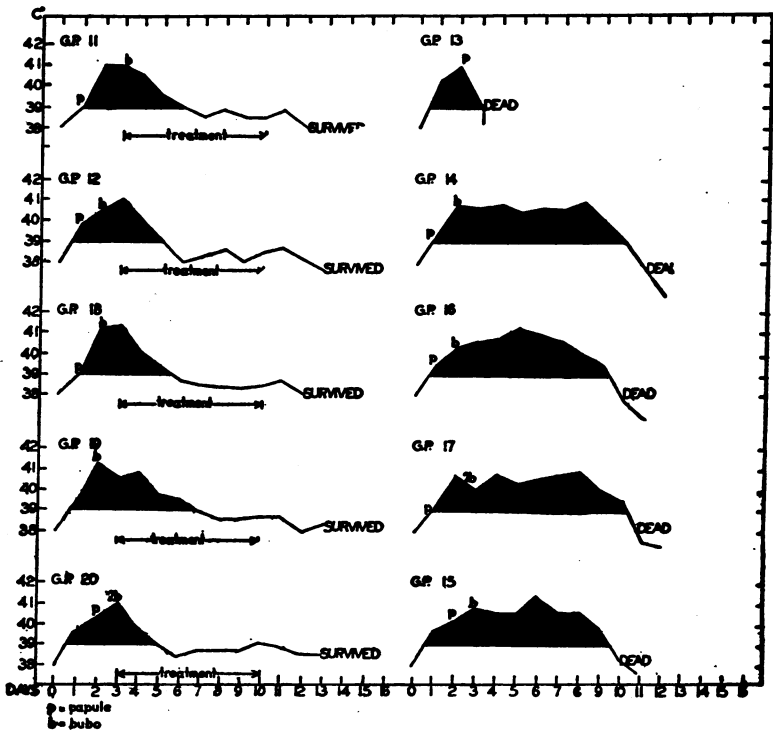


FIGURE 2.—Guinea pigs inoculated intracutaneously with  $12,000 \pm P. pestis$ , strain B 3035, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and sodium bicarbonate and those without treatment.

were positive. The blood level of the drug in 44 specimens of heart blood collected at different periods from animals while under treatment varied from 1 mg. percent to 10 mg. percent with a median level of approximately 5.5 mg. percent, and approximately this same level was obtained in the peripheral blood from the foot.

Figures 1, 2, and 3 record the results of the individual animals of the groups which were inoculated intracutaneously with varying numbers of *P. pestis*, and show the temperature range, time of appearance

of the papule and bubo, period of treatment, and final results among those treated with the drug and the comparable untreated controls.

Figures 4, 5, and 6 record similar findings among the animals which were infected by the bites of fleas.

The protocols of the details of treatment, observations, and final results for each animal are appended.

It will be seen that among animals inoculated in a manner to simulate a flea bite with numbers of *P. pestis* varying from approximately 1,500 to 25,000 there were 13 of 15 untreated controls which died of

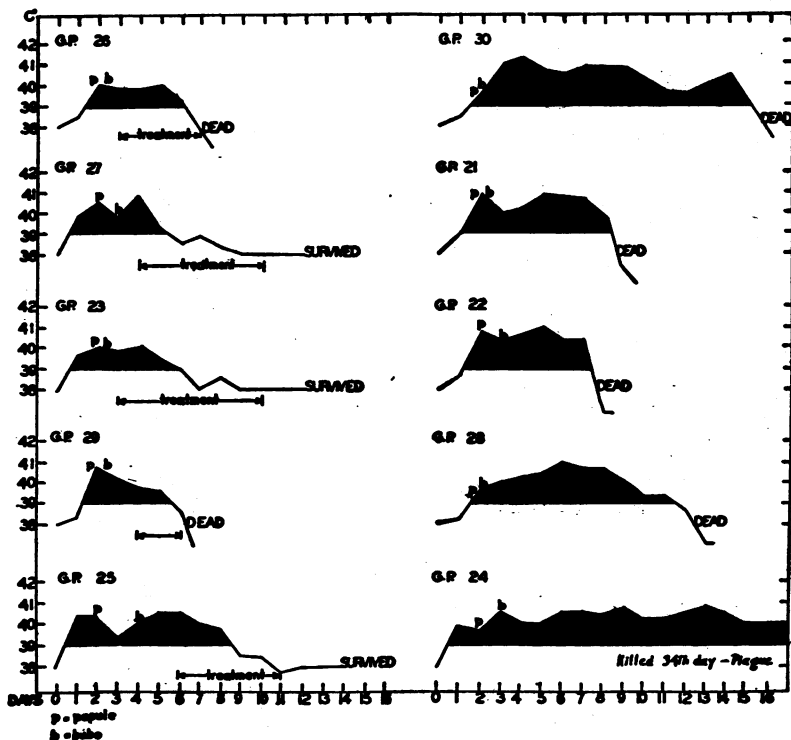


FIGURE 3.—Guinea pigs inoculated intracutaneously with  $25,000 \pm P. pestis$ , strain D 67, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and sodium bicarbonate and those without treatment.

plague. (One was ill with plague and killed on the thirty-fourth day after inoculation; another died of hemorrhage without evidence of plague.) All of these developed a rise in temperature of from  $39^{\circ}$  to  $41^{\circ}$  C., and a papule or bubo or both. These findings continued through several days until about 20 to 30 hours before death when the temperature fell critically. Among fifteen animals similarly inoculated and treated with the drug, the temperature and findings developed but persisted for a shorter period, in most instances with a gradual return to normal with the exception of three which died. One of

these, No. 2, showed no evidence of plague at its necropsy, and probably died of a toxic condition caused by the drug. One death, No. 26, occurred in one of the few treated animals which developed a septicemia.

Nine untreated controls which were infected by flea bites developed the findings described above and died of plague, while among 11 animals similarly infected and treated with the drug, 4 died. One of these, No. 32, died of an acute cervical adenitis probably of traumatic origin. Treatment of another, No. 36, was delayed for 5 days after

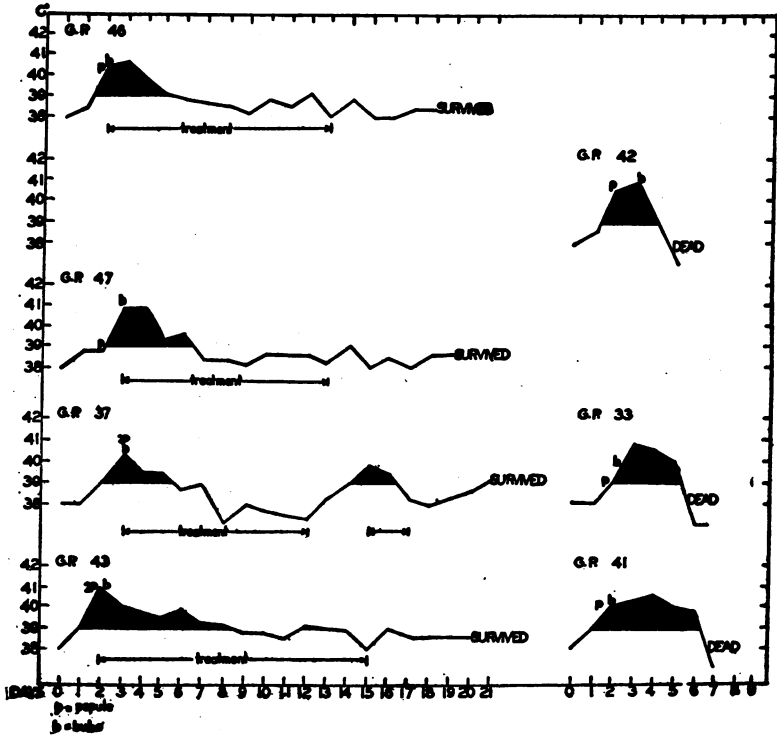


FIGURE 4.—Guinea pigs infected by bites of fleas infected with *P. pestis*, strain B 3035, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and sodium bicarbonate and those without treatment.

inoculation while waiting for the development of a bubo, and septicemia had developed before treatment was commenced. Three of these animals infected by flea bites developed septicemia either before or shortly after treatment was begun. It was noted that the development of septicemia occurred more frequently and death occurred after a shorter course of the disease among animals infected by flea bites.

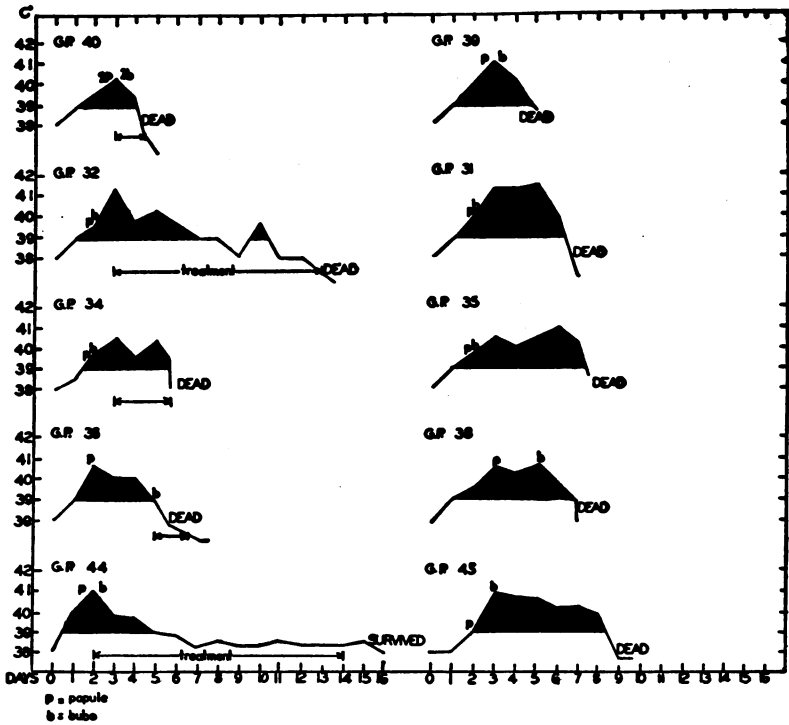


FIGURE 5.—Guinea pigs infected by bites of fleas infected with *P. pestis*, strain B 3035, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and sodium bicarbonate and those without treatment.

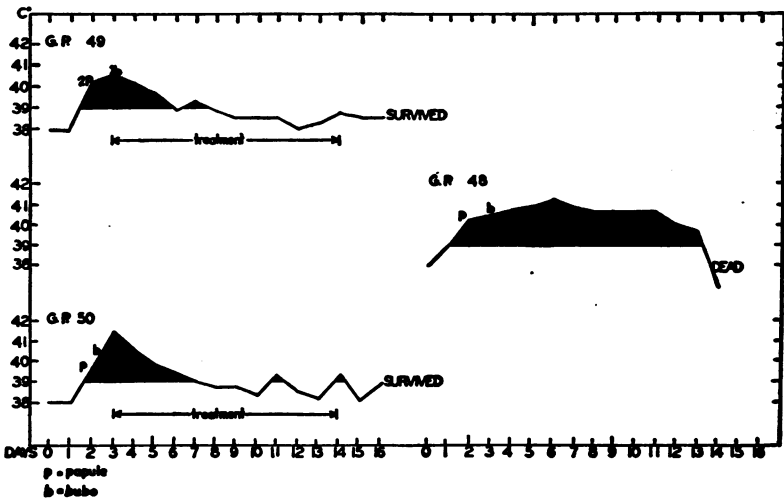


FIGURE 6.—Guinea pigs infected by bites of fleas infected with *P. pestis*, strain B 3035, showing period and range of temperature, survivals, and deaths among those treated with sulfadiazine and sodium bicarbonate and those without treatment.

## SUMMARY AND CONCLUSIONS

Fifteen guinea pigs were inoculated intradermally with virulent *P. pestis* and developed plague, but 13 recovered after treatment with sulfadiazine and showed no evidence of infection at necropsy when killed 21 days after inoculation, and one died with sulfonamide crystals in the kidneys. Thirteen untreated controls died of plague after similar inoculation. One control died of hemorrhage 3 days after inoculation without evidence of plague; one control was killed the thirty-fourth day after inoculation and plague was proved bacteriologically at necropsy.

Eleven guinea pigs infected with plague by flea bites developed the disease, but 7 recovered under treatment with sulfadiazine and showed no evidence of the infection at necropsy 21 days after inoculation. Nine untreated controls which were infected in a similar manner developed the disease and died.

These experiments indicate that the administration of sulfadiazine to guinea pigs in which buboes of plague have been contracted by flea transmission or have been induced by artificial methods simulating flea transmission is of very definite remedial value. The drug treatment should begin as soon as the characteristic buboes and fever have developed and should continue through the febrile period. A blood level of 4 to 7 mg. percent of the drug was usually maintained, but no attempt was made to determine the level required for therapeutic efficiency.

The similarity of the evolution and manifestations of plague induced in guinea pigs and in man by flea transmission lead to the conclusion that this drug may be of great value in the therapy of bubonic plague in man previous to the development of a generalized bacteremia.

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**Appendix**  
*Protocols of guinea pigs inoculated with P. pestis or infected by flea bites and treated with sulfadiazine*  
(First dose 100 mg. sodium sulfadiazine and 100 mg. sulfadiazine. Subsequent doses, 100 mg. sulfadiazine.)

Guinea pig No.	Inoculation	Clinical course from hour of inoculation	Treatment from hour of inoculation	Blood level free sulfadiazine from hour of treatment	Results
1	1600-±P. pestis, strain B 3035, Intraocular.	42 hrs. Papule. 48 hrs. Bubo. 66 hrs. Blood culture negative. 90 hrs. Do. 138 hrs. Do. 162 hrs. Bubo small, papule healing. 186 hrs. Blood culture negative.	48 hrs. First dose. 3 doses daily for 7 days. 2 doses daily for 1 day. Total treatment 9 days with 2,400 mg. sulfadiazine, 100 mg. sodium sulfadiazine.	18 hrs. 2 mg. percent. 42 hrs. 6 mg. percent. 90 hrs. 10 mg. percent. 138 hrs. 7 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
7 (Control)	1600-±P. pestis, strain B 3035, Intraocular.	42 hrs. Papule. 48 hrs. Bubo. 66 hrs. Blood culture negative. 90 hrs. Blood culture positive. 138 hrs. Do.	No treatment.		Found dead morning 7th day. Necropsy, plague.
2	1600-±P. pestis, strain B 3035, Intraocular.	42 hrs. Papule. 66 hrs. Bubo. 90 hrs. Blood culture negative. 138 hrs. Do. 162 hrs. Papule and bubo healing. 198 hrs. Blood culture negative. 216 hrs. Buboes very small. 248 hrs. Animal sick.	72 hrs. First dose. 76 hrs. Second dose. 3 doses daily for 6 days. 2 doses daily for 1 day. Total treatment 8 days, with 2,200 mg. sulfadiazine, 100 mg. sodium sulfadiazine.	18 hrs. 3.5 mg. percent. 46 hrs. 8.0 mg. percent. 114 hrs. 7.0 mg. percent. First mg. 7.0. Total 64.5 mg. percent.	Found dead morning 11th day. Necropsy, no plague.
4 (Control)	1600-±P. pestis, strain B 3035, Intraocular.	42 hrs. Papule. 48 hrs. Bubo. 90 hrs. Blood culture negative. 112 hrs. Bubo large. 138 hrs. Blood culture negative. 186 hrs. Do.	No treatment.		Found dead morning 14th day. Necropsy, plague.
3	1600-±P. pestis, strain B 3035, Intraocular.	42 hrs. Papule. 66 hrs. Bubo. 90 hrs. Blood culture negative. 138 hrs. Do. 162 hrs. Papule healing. 183 hrs. Blood culture negative. 216 hrs. Papule healed, very small bubo.	72 hrs. First dose. 3 doses daily for 6 days. 2 doses daily for 1 day. Total treatment 8 days with 2,100 mg. sulfadiazine, 100 mg. sodium sulfadiazine.	18 hrs. 3.8 mg. percent. 66 hrs. 8.0 mg. percent. 114 hrs. 10.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.

10. (Control)	1500± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule. 66 hrs. Bubo. 138 hrs. Blood culture negative. 186 hrs. Do. 234 hrs. Do. Two large buboes, thick infiltration of skin.	No treatment.		Found dead morning 18th day. Necropsy, plague.
8.	1500± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule. 90 hrs. Blood culture negative. 138 hrs. Do. 186 hrs. Do.	72 hrs. First dose, 3 doses daily for 6 days. 2 doses daily for 1 day. Total treatment 8 days, with 2,100 mg. sulfadiazine, 100 mg. sodium sulfadiazine.	18 hrs. 4.0 mg. percent. 66 hrs. 8.5 mg. percent. 114 hrs. 7.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
6. (Control)	1500± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule. 90 hrs. Blood culture negative. 114 hrs. Bubo. 138 hrs. Blood culture negative. 186 hrs. Blood culture positive.	No treatment.		Death on 11th day. Necropsy, plague.
9.	1500± <i>P. pestis</i> , strain B 3033, intracutaneous.	42 hrs. Papule and bubo. 66 hrs. Blood culture negative. 90 hrs. Do. 138 hrs. Do. 162 hrs. Bubo small. 186 hrs. Blood culture negative.	48 hrs. First dose, 3 doses daily for 7 days. 2 doses daily for 1 day. Total treatment 9 days with 2,400 mg. sulfadiazine, 100 mg. sodium sulfadiazine.	18 hrs. 3.0 mg. percent. 42 hrs. 2.0 mg. percent. 90 hrs. 0.5 mg. percent. 138 hrs. 6.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
5. (Control)	1500± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule and bubo. 66 hrs. Blood culture positive. 90 hrs. Do.	No treatment.		Death on 7th day. Necropsy, plague.
11.	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 66 hrs. Bubo. 114 hrs. Blood culture negative. 144 hrs. Bubo smaller. 162 hrs. Blood culture negative. Papule healing. 210 hrs. Blood culture negative. 216 hrs. Small, hard bubo. 288 hrs. Bubo gone.	72 hrs. First dose, 3 doses daily for 6 days. 2 doses daily for 2 days. Total treatment 8 days with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	42 hrs. 4.0 mg. percent. 90 hrs. 3.5 mg. percent. 138 hrs. 7.5 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
13. (Control)	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule.	No treatment.		Found dead morning 8rd day. Necropsy, hemorrhage.
12.	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 42 hrs. Bubo. 114 hrs. Blood culture negative. 144 hrs. Bubo smaller. 162 hrs. Blood culture negative. Papule healing. 210 hrs. Blood culture negative. 288 hrs. Small, hard bubo. Guinea pig thin, but well.	72 hrs. First dose, 3 doses daily for 6 days. 2 doses daily for 2 days. Total treatment 8 days, with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	42 hrs. 4.5 mg. percent. 90 hrs. 4.8 mg. percent. 138 hrs. 6.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.

Protocols of guinea pigs inoculated with *P. pestis* or infected by flea bites and treated with sulfadiazine—Continued

Guinea pig No.	Inoculation	Clinical course from hour of inoculation	Treatment from hour of inoculation	Blood level free sulfadiazine from hour of treatment	Results
14 (Control)	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 42 hrs. Bubo. 114 hrs. Blood culture negative. 144 hrs. Thick infiltration around large bubo. 162 hrs. Blood culture negative. 210 hrs. Do. 224 hrs. Guinea pig sick.	No treatment.		Found dead morning 12th day. Necropsy, plague.
18	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 42 hrs. Bubo. 114 hrs. Blood culture negative. 138 hrs. Bubo very large. 162 hrs. Blood culture negative. Papule healed. 210 hrs. Blood culture negative. 234 hrs. Bubo small.	66 hrs. First dose. 3 doses daily for 5 days. 2 doses daily for 2 days. Total treatment 8 days, with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	48 hrs. 3.0 mg. percent. 96 hrs. 5.5 mg. percent. 144 hrs. 6.5 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
16 (Control)	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 42 hrs. Bubo. 114 hrs. Blood culture negative. 162 hrs. Do. 210 hrs. Blood culture positive.	No treatment.		Death on 11th day. Necropsy, plague.
19	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	48 hrs. Bubo. 90 hrs. Small and large bubo. 114 hrs. Blood culture negative. 162 hrs. Blood culture negative. Papule healed. 210 hrs. Blood culture negative. 234 hrs. One small bubo.	72 hrs. First dose. 3 doses daily for 5 days. 2 doses daily for 2 days. Total treatment 8 days, with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	42 hrs. 4.5 mg. percent. 90 hrs. 5.5 mg. percent. 138 hrs. 7.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
17 (Control)	20,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	24 hrs. Papule. 66 hrs. Two buboes. 114 hrs. Blood culture negative. 162 hrs. Do. 210 hrs. Buboes very large with thick infiltration of surrounding skin. Blood culture negative.	No treatment.		Found dead morning 12th day. Necropsy, plague.
20	12,000± <i>P. pestis</i> , strain B 3035, intracutaneous.	42 hrs. Papule. 66 hrs. Two buboes. 114 hrs. Blood culture negative. 144 hrs. Buboes smaller. 162 hrs. Blood culture negative. 210 hrs. Do. 234 hrs. One small bubo.	72 hrs. First dose. 3 doses daily for 5 days. 2 doses daily for 2 days. Total treatment 8 days, with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	42 hrs. 4.5 mg. percent. 90 hrs. 5.5 mg. percent. 138 hrs. 5.5 mg. percent.	Survived and killed 21st day. Necropsy, no plague.

15 (Control)	12,000± <i>P. pestis</i> , strain B 3036, intracutaneous.	45 hrs. Papule. 66 hrs. Bubo. 114 hrs. Blood culture positive. 162 hrs. Do. 210 hrs. Do.	No treatment.		Found dead morning 11th day. Necropsy, plague.
26	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 72 hrs. Guinea pig sick. 96 hrs. Blood culture positive. 120 hrs. Bubo large. 144 hrs. Blood culture negative. 160 hrs. Guinea pig sick. 170 hrs. Post-mortem blood culture negative.	72 hrs. First dose. 76 hrs. Second dose. 80 hrs. Third dose. 3 doses daily for 3 days. 2 doses daily for 1 day. Total treatment 5 days, with 1,400 mg. sulfadiazine, 300 mg. sodium sulfadiazine, 2,800 mg. sodium bicarbonate.	24 hrs. 3.4 mg. percent. 72 hrs. 3.8 mg. percent.	Death on 7th day. Necropsy, plague.
30 (Control)	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 96 hrs. Blood culture negative. 144 hrs. Blood culture negative. Large and small bubo. 192 hrs. Blood culture negative. 240 hrs. Guinea pig sick.	No treatment.		Found dead morning 16th day. Necropsy, plague.
37	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule. 64 hrs. Bubo. 144 hrs. Blood culture negative. Two small buboes. 192 hrs. Blood culture negative. 240 hrs. One very small bubo.	96 hrs. First dose. 100 hrs. Second dose. 104 hrs. Third dose. 3 doses daily for 4 days. 2 doses daily for 2 days. Total treatment 7 days, with 1,900 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 3,800 mg. sodium bicarbonate.	48 hrs. 5.0 mg. percent. 96 hrs. 10.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
21 (Control)	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 72 hrs. Two small buboes. 144 hrs. Blood culture positive. 192 hrs. Do.	No treatment.		Death on 9th day. Necropsy, plague.
23	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 72 hrs. Guinea pig sick. 96 hrs. Blood culture negative. Papule open. 144 hrs. Blood culture negative. Papule open. 168 hrs. Bubo smaller. 192 hrs. Blood culture negative. Papule healing.	76 hrs. First dose. 3 doses daily for 6 days 2 doses daily for 2 days Total treatment 8 days, with 2,000 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 4,000 mg. sodium bicarbonate.	21 hrs. 3.0 mg. percent. 69 hrs. 6.0 mg. percent. 117 hrs. 6.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
22 (Control)	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule. 72 hrs. Bubo. 96 hrs. Blood culture positive. Two small buboes. 144 hrs. Blood culture positive.	No treatment.		Death on 8th day. Necropsy, plague.

Protocols of guinea pigs inoculated with *P. pestis* or infected by flea bites and treated with sulfadiazine—Continued

Guinea pig No.	Inoculation	Clinical courses from hour of inoculation	Treatment from hour of inoculation	Blood level free sulfadiazine from hour of treatment	Results
29	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 96 hrs. Guinea pig thin. 144 hrs. Blood culture negative. Small and large bubo. 150 hrs. Guinea pig sick.	96 hrs. First dose. 100 hrs. Second dose. 104 hrs. Third dose. 3 doses daily for 2 days. Total treatment 3 days, with 800 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 1,800 mg. sodium bicarbonate.	48 hrs. 6.0 mg. percent.	Found dead morning 7th day. Necropsy, plague.
28 (Control)	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule and bubo. 144 hrs. Blood culture negative. Small and large bubo. 192 hrs. Blood culture negative. 240 hrs. Guinea pig sick.	No treatment.		Death on 13th day. Necropsy, plague.
25	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule. 96 hrs. Bubo. 102 hrs. Two small buboes. 120 hrs. Buboes larger. 168 hrs. Blood culture negative. Buboes large. 192 hrs. Blood culture negative. 240 hrs. Buboes small.	144 hrs. First dose. 148 hrs. Second dose. 2 doses daily for 1 day. 3 doses daily for 3 days. 2 doses daily for 1 day. Total treatment 6 days, with 1,600 mg. sulfadiazine, 100 mg. sodium sulfadiazine, 3,400 mg. sodium bicarbonate.	30 hrs. 8.0 mg. percent. 48 hrs. 2.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
24 (Control)	25,000± <i>P. pestis</i> , strain D 67, intracutaneous.	48 hrs. Papule. 72 hrs. Bubo. 144 hrs. Bubo large. 168 hrs. Blood culture negative. Do. 192 hrs. Do. 240 hrs. Very large and small bubo. 288 hrs. Two very large buboes. 316 hrs. Do.	No treatment.		Killed on 34th day. Necropsy, plague.
46	Flea bite, strain B 3035.	48 hrs. Papule and bubo. 100 hrs. Large and small bubo. 168 hrs. Papule healed, buboes smaller.	62 hrs. First dose. 3 doses daily for 6 days. 2 doses daily for 5 days. Total treatment, 12 days, with 2,900 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 6,800 mg. sodium bicarbonate.	36 hrs. 7.0 mg. percent. Micro test.	Survived and killed 21st day. Necropsy, no plague.

47	----- (Control)	Flea bite, strain B 3035.	Papule. Bubo. Papule healed, bubo smaller.	78 hrs. First dose. 3 doses daily for 6 days. 79 hrs. Second dose. 2 doses daily for 4 days. 79 hrs. Third dose. 1 dose daily for 1 day. Total treatment, 11 days, with 3,700 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 5,200 mg. sodium bicarbonate.	18 hrs. 7.0 mg. percent. 204 hrs. 7.5 mg. percent. Micro test.	Survived and killed 21st day. Necropsy, no plague.
48	----- (Control)	Flea bite, strain B 3035.	Papule. Bubo. Guinea pig sick.	No treatment.		Found dead morning 6th day. Necropsy, plague.
49	----- (Control)	Flea bite, strain B 3035.	Two papules, one bubo. Blood culture negative. Bubo smaller. Guinea pig well. Small residual bubo. Bubo larger. Guinea pig not very well.	48 hrs. First dose. 3 doses daily for 7 days. 2 doses daily for 1 day. 1 dose daily for 1 day. 342 hrs. First dose (2nd series). 3 doses daily for 2 days. Total treatment 13 days, with 3,200 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 6,000 mg. sodium bicarbonate.	49 hrs. 5.4 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
50	----- (Control)	Flea bite, strain B 3035.	Papule. Bubo. Blood culture positive.	No treatment.		Death on 6th day. Necropsy, plague.
51	----- (Control)	Flea bite, strain B 3035.	Two papules, one bubo. Bubo very large. Noisy, difficult breathing. Papules healing. Bubo smaller. Breathing still noisy and uneven. Guinea pig fat. Breathing normal. Bubo small.	48 hrs. First dose. 52 hrs. Second dose. 56 hrs. Third dose. 3 doses daily for 9 days. 2 doses daily for 4 days. Total treatment 14 days, with 3,700 mg. sulfadiazine, 700 mg. sodium sulfadiazine, 7,600 mg. sodium bicarbonate.	96 hrs. 6.0 mg. percent. Micro test.	Survived and killed 21st day. Necropsy, no plague.
52	----- (Control)	Flea bite, strain B 3035.	Papule. Bubo. Two large buboes. Guinea pig thin.	No treatment.		Found dead morning 7th day. Necropsy, plague.
53	----- (Control)	Flea bite, strain B 3035.	Two papules, two buboes.	72 hrs. First dose. 76 hrs. Second dose. 80 hrs. Third dose. 3 doses daily for 1 day. Total treatment 2 days, with 600 mg. sulfadiazine, 400 mg. so- dium sulfadiazine, 1,200 mg. sodium bicarbonate.		Found dead morning 8th day. Necropsy, plague.

*Protocols of guinea pigs inoculated with P. pestis or infected by flea bites and treated with sulfadiazine—Continued*

Guinea pig No.	Inoculation	Clinical course from hour of inoculation	Treatment from hour of inoculation	Blood level free sulfadiazine from hour of treatment	Results
29. (Control)	Flea bite, strain B 3035.	72 hrs. Papule. 78 hrs. Bubo.	No treatment.		Found dead morning 6th day. Necropsy, plague.
32	Flea bite, strain B 3035.	48 hrs. Papule and bubo. 66 hrs. Blood large. 90 hrs. Blood culture positive. 114 hrs. Guinea pig weak and sick. 132 hrs. Guinea pig weak and sick. Buboes smaller. 176 hrs. Guinea pig improved. 272 hrs. Guinea pig fat, buboes small. Throat injured when feeding capsules. Noisy, difficult breathing. 276 hrs. Guinea pig dying.	66 hrs. First dose. 70 hrs. Second dose. 74 hrs. Third dose. 3 doses daily for 6 days. 2 doses daily for 3 days. Total treatment 10 days, with 2,600 mg. sulfadiazine, 500 mg. sodium sulfadiazine, 5,400 mg. sodium bicarbonate.	94 hrs. 1.0 mg. percent. 72 hrs. 4.0 mg. percent.	Found dead morning 13th day. Necropsy, right inguinal bubo, few <i>P. pestis</i> .  Lung, liver, spleen, no plague. Cervical cellulitis
31. (Control)	Flea bite, strain B 3035.	Papule and bubo. Blood culture positive. Bubo very large.	No treatment.		Found dead morning 7th day. Necropsy, plague.
34	Flea bite, strain B 3035.	48 hrs. Papule and bubo. 52 hrs. Guinea pig sick. 72 hrs. Small and large bubo. Edema around large. 120 hrs. Blood culture positive.	52 hrs. First dose. 56 hrs. Second dose. 60 hrs. Third dose. 3 doses daily for 1 day. 2 doses daily for 2 days. Total treatment 4 days, with 900 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 1,400 mg. sodium bicarbonate.	68 hrs. 4.0 mg. percent.	Death on 6th day. Necropsy, plague.
35. (Control)	Flea bite, strain B 3035.	48 hrs. Papule and bubo. 52 hrs. Guinea pig sick. 120 hrs. Blood culture positive.	No treatment.		Death on 7th day. Necropsy, plague.
36	Flea bite, strain B 3035.	48 hrs. Papule. 120 hrs. Bubo. 120 hrs. (Before treatment.) Blood culture positive. 150 hrs. Guinea pig sick.	120 hrs. First dose. 124 hrs. Second dose. 126 hrs. Third dose. 3 doses daily for 1 day. Total treatment 2 days, with 400 mg. sulfadiazine, 500 mg. sodium sulfadiazine, 1,200 mg. sodium bicarbonate.		Found dead morning 7th day. Necropsy, plague.
38. (Control)	Flea bite, strain B 3035.	Papule. Blood culture positive.	No treatment.		Death on 7th day. Necropsy, plague.



44.....	Flea bite, strain B 3035.	48 hrs. Papule and bubo. 120 hrs. Bubo large. 240 hrs. Bubo small.	48 hrs. First dose. 66 hrs. Second dose. 86 hrs. Third dose. 3 doses daily for 8 days. 2 doses daily for 4 days. Total treatment 13 days, with 3,500 mg. sulfadiazine, 600 mg. sodium sulfadiazine, 7,000 mg. sodium bicarbonate.	96 hrs. 5.5 mg. percent. Micro test.	Survived and killed 21st day. Necropsy, no plague.
45 (Control)	Flea bite, strain B 3035.	48 hrs. Papule. 72 hrs. Bubo. 128 hrs. Guinea pig sick.	No treatment.		Death on 9th day. Necropsy, plague.
49.....	Flea bite, strain B 3035.	48 hrs. Two papules. 72 hrs. Two buboes. 264 hrs. Buboes very small.	72 hrs. First dose. 76 hrs. Second dose. 80 hrs. Third dose. 3 doses daily for 7 days. 3 doses daily for 3 days. 2 doses daily for 3 days. 1 dose daily for 1 day. Total treatment 12 days, with 3,000 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 5,400 mg. sodium bicarbonate.	120 hrs. 4.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
50.....	Flea bite, strain B 3035.	48 hrs. Papule. 64 hrs. Bubo. 144 hrs. Massive bubo. 336 hrs. Bubo small.	54 hrs. First dose. 3 doses daily for 7 days. 2 doses daily for 3 days. 1 dose daily for 1 day. Total treatment 12 days, with 2,800 mg. sulfadiazine, 200 mg. sodium sulfadiazine, 5,600 mg. sodium bicarbonate.	120 hrs. 7.0 mg. percent.	Survived and killed 21st day. Necropsy, no plague.
48 (Control)	Flea bite, strain B 3035.	48 hrs. Papule. 72 hrs. Bubo.	No treatment.		Found dead morning 14th day. Necropsy, plague.

## COMPLEMENT FIXATION IN THE RICKETTSIAL DISEASES— TECHNIQUE OF THE TEST<sup>1</sup>

By IDA A. BENGTON, *Senior Bacteriologist, United States Public Health Service*

The complement fixation test has been applied in the study of the following rickettsial diseases: endemic typhus (murine typhus), epidemic typhus (European typhus) (1, 2, 3), Rocky Mountain spotted fever (4), Tobia fever of Colombia (probably identical with Rocky Mountain spotted fever), and Q fever of North America and Australia (probably identical) (5).

The test is quantitative and the present report presents its details more fully than has previously been done. For the sake of economy and convenience the various reagents in amounts of 0.2 cc. are employed. The tests are made in tubes measuring 10–11 × 75 mm. The reagents, except serum dilutions and antigen, are delivered in the tubes by means of an automatic pipette set at 0.2 cc. for salt solution and complement and 0.4 cc. for the mixture of hemolysin and sheep red corpuscles. Serum dilutions are made by means of a syringe pipette. The total volume in each tube is 1 cc.

### REAGENTS

The reagents include the usual hemolytic system, with guinea pig complement, antishoop cells rabbit hemolysin, and sheep red blood corpuscles, the antigen, and standard serum.

### THE HEMOLYTIC SYSTEM

(a) *Sheep's red blood cells.*—The sheep cells are employed in a 2 percent suspension in 0.85 percent physiological salt solution after being washed at least three times so that the supernatant fluid shows no tinge of red. In the hemolysin titration, 0.2 cc. amounts of the 2 percent suspension are used, while in the test proper 0.4 cc. of the mixture of equal volumes of the 2 percent suspension and the proper hemolysin dilution are used.

(b) *Hemolysin.*—The hemolysin is prepared by inoculating rabbits with washed sheep cells according to the method of Kolmer (6) or Kilduffe (7). It is preserved with an equal volume of glycerin.

Titration of hemolysin: The following dilutions are prepared from a 1:100 dilution of hemolysin (2 cc. of a 50 percent glycerinated hemolysin + 98 cc. of 0.85 percent saline): 1:1,000, 1:1,200, 1:1,600, 1:2,000, 1:2,400, 1:3,000, 1:4,000, 1:5,000, 1:6,000, 1:8,000, 1:10,000, 1:12,000. These dilutions in 0.2 cc. amounts are transferred to test tubes in duplicate. To each tube is added the following: 0.2 cc. complement diluted 1:40, 0.4 cc. saline, and 0.2 cc. 2 percent sheep red corpuscles.

<sup>1</sup> From the Division of Infectious Diseases, National Institute of Health.

The tubes are shaken individually after the addition of each reagent and incubated in the 37° water bath for 1 hour. The unit of hemolysin is 0.2 cc. of the highest dilution showing complete hemolysis. Two units of hemolysin are used in the test, and, therefore, the dilution of hemolysin to be used is that one which has twice the concentration of the unit (e. g., if the unit is 0.2 of the 1:3,000 dilution, 2 units are contained in 0.2 cc. of the 1:1,500 dilution).

(c) *Complement.*—Complement is obtained by bleeding 10 to 15 guinea pigs from the heart and the blood from each guinea pig is collected separately in large test tubes previously rinsed with sterile 0.85 percent salt solution. Care is taken not to cause rupture of the red corpuscles. The needle is removed from the syringe, and the blood allowed to flow slowly into the tube. The tubes are allowed to stand in a refrigerator over-night, and in most of the tubes the clot will have separated from the serum. The serum is removed by means of a Pasteur pipette with a rubber bulb attached. The serums from all the tubes are pooled and then centrifuged to precipitate remaining cells. Tests have been made on various occasions for nonspecific fixability, hemolytic activity, and the presence of natural antisheep hemolysin. Results show that when serums from such a large number of guinea pigs are pooled, these tests are not necessary on individual serums. The complement is preserved by the addition of an amount of saturated NaCl solution equivalent to one-tenth the volume of the serum. The salted complement is kept in the refrigerator and removed only long enough to remove the desired amount of the reagent.

*Titration of complement.*—The complement is titrated, using a 1:40 dilution prepared as follows: 1 cc. complement, 3 cc. distilled water (to restore tonicity), and 36 cc. 0.85 percent salt solution.

A 0.2 cc. pipette graduated in hundredths is used for measuring the following amounts of diluted complement: 0.08, 0.10, 0.12, 0.14, 0.16, 0.18, 0.20 cc. This is done in duplicate. Sterile 0.85 percent salt solution is added in such amounts that the volume in each tube is 0.4 cc. The antigen in the dilution used in the test is added in amounts of 0.2 cc. The tubes are shaken individually after the addition of each reagent.

The complement mixtures are incubated in the 37° water bath for 1 hour, after which 0.4 cc. of sensitized sheep cells is added (equal parts of 2 percent sheep cells and the dilution of hemolysin which contains 2 units per 0.2 cc., prepared by thorough mixing 10 minutes previously).

Readings are made after a further hour's incubation. The unit is the next to the smallest amount showing complete hemolysis. Two units of complement are used in the test.

## ANTIGEN

Antigens are prepared from rickettsiae grown in the yolk sac of fertile hen eggs (method of Cox (8)). Only such yolk sacs are used as contain a large number of rickettsiae. This applies to endemic and epidemic typhus and Q fever. The yield of rickettsiae in Rocky Mountain spotted fever is usually less than in the typhus fevers and Q fever, but even though rickettsiae are not numerous, satisfactory antigens have been prepared.

The infected yolk sacs are weighed and ground in a mortar with alundum or in the Waring Blendor without alundum and prepared as 10 percent suspensions with 0.85 percent salt solution containing 1:10,000 merthiolate. After slow centrifugation to remove coarse particles, the supernatant portion is centrifuged in the angle centrifuge at 4,000 r.p.m. for 1 hour. The precipitate is suspended in 0.85 percent sterile saline containing 1:10,000 merthiolate. After standing in 50 cc. centrifuge tubes in the refrigerator for a week or more a considerable amount of precipitate settles out leaving a somewhat turbid suspension. The supernatant portion is pipetted off and this serves as antigen. The antigens as prepared are stable over a period of several months when stored at ice-box temperature. Epidemic typhus vaccine has been successfully employed as antigen in epidemic typhus. Due to the considerable amount of cross fixation it may also be made use of provisionally in testing suspected endemic typhus serums.

Antigens are titrated against a standard positive serum which has been diluted appropriately, and antigen titers have been found to range from 1/8 to 1/128 for epidemic and endemic typhus and somewhat lower for Q fever. Rocky Mountain spotted fever antigens have been used undiluted and diluted  $\frac{1}{2}$  and  $\frac{1}{4}$ . The titer or unit of the antigen may be considered to be the smallest amount which gives 4+ fixation with the standard serum. Four units of antigen are used in the test.

The serum selected for titrating antigens may be a serum of moderately high titer (1/64 to 1/128) diluted 1/16 or 1/32. Occasional titrations of antigen against one dilution of serum are desirable, or cross titrations of varying dilutions of antigen against varying dilutions of serum may be carried out.

## SERUMS

Serums are inactivated at 56° C. for one-half hour. Serum dilutions are prepared with a syringe pipette. Twofold dilutions are used ranging from 1/4 to 1/512, and higher dilutions are made if the end point is not reached. The 1/4 dilution is prepared by adding 0.3 cc. saline to 0.1 cc. serum. Amounts of 0.2 cc. are carried over to the 0.2 cc. amounts of saline contained in the tubes for the higher dilutions.

## THE TEST

To the serum dilutions contained in the tubes are added 0.2 cc. of the proper dilution of antigen (4 units) and 0.2 cc. of complement (2 units).

After 1 hour's incubation in the 37° water bath the sensitized sheep cells are added in 0.4 cc. amounts, the hemolysin (2 units per 0.2 cc.) and 2 percent sheep cells having been prepared by thorough mixing 10 minutes previously. After further incubation in the 37° water bath for 1 hour, the test is placed at the cold room temperature and read the following morning. Positive results are recorded as 4, 3, 2, 1+, and trace, and the titer is read as the highest dilution showing 3 or 4+ fixation.

The following controls are set up:

**Serum controls.** To duplicate tubes of the four lowest dilutions are added the same reagents as for the test except that salt solution is substituted for antigen.

**Antigen controls.** Antigen controls contain twice the volume of the dilution used in the test, i.e., 0.4 cc., and 0.2 cc. of complement and 0.4 cc. of sensitized cells.

**Hemolytic system.** The hemolytic system control consists of four tubes containing 0.05, 0.1, 0.15, and 0.2 cc. of the dilution of complement used in the test, these amounts representing  $\frac{1}{2}$ , 1, 1 $\frac{1}{2}$ , and 2 units. The volume in each tube is made up to 0.6 cc. with sterile saline, and 0.4 cc. sensitized cells added. The tube containing 0.05 should show 1 or 2+ fixation, and the three remaining tubes should be completely hemolyzed.

**Standard serum.** A standard serum composed of a pooled lot of serums from recovered guinea pigs is titrated with each test, using the same dilutions as for the serums under test.

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**THE ALIPHATIC ALCOHOLS: THEIR TOXICITY AND POTENTIAL DANGERS IN RELATION TO THEIR CONSTITUTION AND THEIR FATE IN METABOLISM<sup>1</sup>**

**A Review**

This study covers a review of the literature on the toxicity and potential dangers of monovalent, bivalent, trivalent, and polyvalent alcohols. Each group is followed by a discussion of the relation of the chemical constitution, physical-chemical properties, and metabolic fate of these alcohols to their toxicological action. The study is based on information gathered from approximately 1,200 publications which are quoted in the bibliography.

**DEATHS DURING WEEK ENDED MARCH 11, 1944**

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

	Week ended Mar. 11, 1944	Corresponding week, 1943
<b>Data for 92 large cities of the United States:</b>		
Total deaths.....	9,526	10,181
Average for 3 prior years.....	9,685	-----
Total deaths, first 10 weeks of year.....	103,505	102,388
Deaths under 1 year of age.....	597	727
Average for 3 prior years.....	608	-----
Deaths under 1 year of age, first 10 weeks of year.....	6,303	7,284
<b>Data from industrial insurance companies:</b>		
Policies in force.....	66,357,378	65,413,543
Number of death claims.....	13,836	14,021
Death claims per 1,000 policies in force, annual rate.....	10.9	11.2
Death claims per 1,000 policies, first 10 weeks of year, annual rate.....	11.6	10.8

<sup>1</sup> The aliphatic alcohols: Their toxicity and potential dangers in relation to their constitution and their fate in metabolism. By W. F. von Oettingen. Public Health Bulletin No. 281. Government Printing Office, 1943. (Distributed February 1944.) For sale by the Superintendent of Documents, Washington 25, D. C. Price 35 cents.

# PREVALENCE OF DISEASE

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

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## UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 18, 1944

### Summary

For the second consecutive week the incidence of meningitis for the country as a whole has fallen below that for both the preceding week and the corresponding week of last year. A total of 497 cases was reported, as compared with 517 last week, 614 a year ago, and a 5-year (1939-43) median of 54. The cumulative total for the year to date is 6,087, as compared with 4,659 for the same period last year and 2,689 in 1929, the year of record having the next highest incidence.

Currently, increased incidence was reported in 5 of the 9 geographic divisions. Slight decreases occurred in the Middle Atlantic, the East North Central, and the Mountain areas, and the largest decrease in the East South Central area. Nine States reporting more than 20 cases each (last week's figures in parentheses) are as follows: *Increases*—Massachusetts 25 (8), Ohio 29 (26), Michigan 35 (28), Missouri 26 (20), Virginia 24 (17), California 35 (32); *decreases*—New York 55 (67), Pennsylvania 39 (40), Illinois 25 (29).

Slight increases were recorded for measles and scarlet fever, with totals of 32,802 and 7,373 cases, respectively, or 46 percent and 67 percent above the respective corresponding 5-year medians. To date, 240,054 cases of measles and 61,731 cases of scarlet fever have been reported, as compared with 5-year medians of 158,612 and 44,084, respectively. The incidence of these diseases to date is above that for any corresponding period since 1938.

A total of 20 cases of poliomyelitis was reported (7 in California), as compared with 19 last week and a 5-year median of 16.

Incidence below corresponding 5-year medians is reported for diphtheria, influenza, smallpox, typhoid fever, and whooping cough. The cumulative figures for all of these diseases except influenza are also below the respective medians.

A total of 9,537 deaths was recorded in 93 large cities of the United States, as compared with 9,548 for the preceding week and a 3-year (1941-43) average of 9,389. The cumulative total to date is 113,209, as compared with 112,524 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended March 18, 1944, and comparison with corresponding week of 1943 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis-meningococcus,		
	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43
	Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943	
<b>NEW ENGLAND</b>												
Maine.....	2	0	0	-----	-----	3	247	9	94	2	12	1
New Hampshire.....	0	0	0	-----	-----	-----	3	13	13	0	0	0
Vermont.....	0	0	0	2	-----	-----	173	310	18	0	3	0
Massachusetts.....	5	5	2	-----	-----	-----	708	1,394	830	25	34	2
Rhode Island.....	0	1	0	-----	-----	-----	376	14	14	4	24	1
Connecticut.....	1	0	1	5	3	4	407	418	413	5	3	1
<b>MIDDLE ATLANTIC</b>												
New York.....	9	21	21	16	18	133	2,925	2,321	1,408	55	64	3
New Jersey.....	3	3	4	13	15	16	1,366	1,467	443	15	29	1
Pennsylvania.....	9	10	17	9	3	-----	1,268	2,851	1,087	39	32	7
<b>EAST NORTH CENTRAL</b>												
Ohio.....	6	5	7	19	20	22	3,413	732	196	29	6	2
Indiana.....	15	2	7	9	3	57	266	403	125	9	5	1
Illinois.....	8	6	21	117	13	41	1,280	963	645	25	18	4
Michigan <sup>1</sup> .....	9	8	8	6	27	27	1,651	555	248	35	7	1
Wisconsin.....	0	1	2	52	40	200	1,701	1,131	871	5	4	1
<b>WEST NORTH CENTRAL</b>												
Minnesota.....	4	3	3	1	-----	-----	1,570	94	179	7	3	0
Iowa.....	4	0	2	30	-----	28	213	332	196	0	0	0
Missouri.....	3	6	6	3	8	11	474	375	161	26	27	0
North Dakota.....	2	0	1	22	1	21	245	131	64	3	1	0
South Dakota.....	2	0	0	-----	2	2	75	52	27	0	0	0
Nebraska.....	3	0	2	4	24	15	70	249	107	0	2	1
Kansas.....	5	5	3	5	6	13	761	513	513	5	5	1
<b>SOUTH ATLANTIC</b>												
Delaware.....	0	2	1	-----	-----	-----	15	36	8	0	3	0
Maryland <sup>2</sup> .....	5	11	5	9	4	41	1,182	73	170	9	25	2
District of Columbia.....	0	0	5	1	5	5	129	100	83	1	3	1
Virginia.....	1	7	10	261	792	792	1,235	779	376	24	58	3
West Virginia.....	2	3	4	40	68	218	566	36	36	12	3	2
North Carolina.....	7	8	10	14	77	77	2,106	77	921	11	23	1
South Carolina.....	5	3	3	449	840	774	492	190	190	13	18	0
Georgia.....	4	4	8	24	152	152	303	187	254	6	9	1
Florida.....	1	4	4	2	10	10	308	62	119	7	17	0
<b>EAST SOUTH CENTRAL</b>												
Kentucky.....	3	6	5	56	5	69	86	1,054	91	8	12	2
Tennessee.....	5	7	6	81	93	161	312	341	165	11	8	2
Alabama.....	9	5	6	252	158	335	648	226	-----	12	10	3
Mississippi <sup>2</sup> .....	15	5	8	-----	-----	-----	-----	-----	-----	6	44	1
<b>WEST SOUTH CENTRAL</b>												
Arkansas.....	7	12	7	127	99	291	291	102	102	4	5	0
Louisiana.....	1	6	6	7	13	27	68	232	154	6	13	1
Oklahoma.....	6	7	7	155	190	213	88	65	65	4	2	1
Texas.....	144	34	36	1,201	1,543	1,543	2,038	1,160	1,160	20	28	4
<b>MOUNTAIN</b>												
Montana.....	1	2	2	10	24	24	105	343	87	0	0	0
Idaho.....	0	0	0	37	-----	-----	72	126	71	0	2	0
Wyoming.....	2	0	0	1	46	5	116	177	62	1	0	0
Colorado.....	1	7	8	36	46	46	350	717	247	0	0	0
New Mexico.....	1	0	2	4	1	5	140	20	37	0	1	0
Arizona.....	5	4	2	126	68	209	557	47	95	3	1	1
Utah <sup>2</sup> .....	0	1	1	158	8	8	31	466	155	1	7	0
Nevada.....	0	0	0	8	21	-----	5	27	0	0	1	0
<b>PACIFIC</b>												
Washington.....	2	3	2	-----	1	9	181	947	322	8	9	1
Oregon.....	5	-----	4	45	25	28	102	491	421	6	9	0
California.....	21	23	23	59	74	211	2,094	742	742	35	29	2
Total.....	243	240	293	3,465	4,536	6,366	32,802	23,150	22,621	497	619	54
11 weeks.....	2,790	3,191	3,542	314,418	49,953	54,065	240,054	159,593	158,612	6,087	4,650	687

See footnotes at end of table.



Telegraphic morbidity reports from State health officers for the week ended March 18, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Pollomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever <sup>1</sup>		
	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43
	Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943		Mar. 18, 1944	Mar. 20, 1943	
<b>NEW ENGLAND</b>												
Maine.....	0	0	0	22	20	11	0	0	0	1	0	0
New Hampshire.....	0	0	0	4	6	3	0	0	0	0	0	0
Vermont.....	2	0	0	17	8	8	0	0	0	0	0	0
Massachusetts.....	0	0	0	447	592	169	0	0	0	2	1	1
Rhode Island.....	0	1	0	14	20	11	0	0	0	0	0	0
Connecticut.....	0	0	0	96	69	69	0	0	0	0	1	1
<b>MIDDLE ATLANTIC</b>												
New York.....	0	1	0	623	655	655	0	0	0	5	8	5
New Jersey.....	0	2	0	288	183	197	0	0	0	0	0	1
Pennsylvania.....	0	2	0	656	342	342	0	0	0	2	9	8
<b>EAST NORTH CENTRAL</b>												
Ohio.....	0	0	0	507	327	343	0	5	0	1	3	2
Indiana.....	0	0	0	225	117	191	0	1	1	1	1	1
Illinois.....	1	2	0	551	224	446	1	8	8	0	2	2
Michigan <sup>2</sup> .....	0	0	0	264	96	259	0	0	2	2	1	1
Wisconsin.....	0	3	1	332	335	186	0	1	3	0	0	0
<b>WEST NORTH CENTRAL</b>												
Minnesota.....	1	0	0	219	62	88	0	0	2	0	0	0
Iowa.....	0	0	0	178	94	65	0	1	1	0	1	1
Missouri.....	1	2	1	173	138	86	0	0	8	3	0	2
North Dakota.....	0	0	0	71	7	21	0	0	0	1	0	0
South Dakota.....	0	0	0	34	15	12	0	1	1	0	0	0
Nebraska.....	2	0	0	86	36	30	0	0	1	0	0	0
Kansas.....	0	0	0	131	64	67	0	2	1	0	1	0
<b>SOUTH ATLANTIC</b>												
Delaware.....	0	0	0	16	6	18	0	0	0	0	0	0
Maryland <sup>1</sup> .....	0	0	0	238	112	47	0	0	0	1	7	1
District of Columbia.....	9	0	0	222	16	18	0	0	0	0	0	0
Virginia.....	0	1	0	93	53	36	0	0	0	3	2	2
West Virginia.....	0	0	0	116	24	46	0	0	0	4	2	2
North Carolina.....	0	0	0	41	28	34	0	10	0	0	5	0
South Carolina.....	0	0	0	8	8	5	0	0	0	1	0	0
Georgia.....	0	0	0	17	6	14	0	0	0	8	2	3
Florida.....	0	1	1	14	11	8	0	0	0	1	5	3
<b>EAST SOUTH CENTRAL</b>												
Kentucky.....	0	1	0	77	49	94	0	0	0	3	0	2
Tennessee.....	0	0	0	96	51	75	0	0	1	0	0	2
Alabama.....	0	0	0	17	18	23	0	1	1	0	1	2
Mississippi <sup>1</sup> .....	0	2	0	4	7	6	0	0	0	3	0	1
<b>WEST SOUTH CENTRAL</b>												
Arkansas.....	0	0	0	12	7	7	0	3	3	2	3	3
Louisiana.....	0	0	1	17	11	11	0	1	1	1	1	5
Oklahoma.....	0	0	0	16	27	21	0	0	0	2	1	1
Texas.....	2	3	1	155	65	65	5	0	2	8	6	6
<b>MOUNTAIN</b>												
Montana.....	0	0	0	53	6	26	0	0	0	0	0	0
Idaho.....	1	0	0	109	12	11	0	0	0	0	0	1
Wyoming.....	0	0	0	8	40	11	0	0	0	0	0	0
Colorado.....	1	0	0	71	103	51	1	1	1	3	0	0
New Mexico.....	2	0	0	17	1	5	0	0	0	3	0	0
Arizona.....	0	1	1	20	16	7	0	0	0	1	0	1
Utah <sup>2</sup> .....	0	0	0	109	57	29	0	0	0	0	0	0
Nevada.....	0	0	0	0	6	0	0	0	0	0	0	0
<b>PACIFIC</b>												
Washington.....	0	1	0	360	46	46	0	0	0	1	1	1
Oregon.....	0	1	0	156	6	11	1	0	0	0	0	1
California.....	7	2	2	373	158	170	0	1	1	7	3	5
Total.....	20	26	16	7,373	4,360	4,426	8	36	65	70	67	87
11 weeks.....	263	302	287	61,731	42,595	44,084	144	300	521	816	585	834

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 18, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Whooping cough			Week ended March 18, 1944								
	Week ended—		Median 1939-43	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularaemia	Typhus fever
	Mar. 18, 1944	Mar. 20, 1943			Amebic	Bacillary	Unspecified					
<b>NEW ENGLAND</b>												
Maine.....	36	67	32	0	0	0	0	0	0	0	0	0
New Hampshire.....	0	1	5	0	0	0	0	0	0	0	0	0
Vermont.....	15	23	35	0	0	0	0	0	0	0	0	0
Massachusetts.....	94	166	171	0	0	2	0	0	0	0	0	0
Rhode Island.....	0	34	28	0	0	0	0	0	0	0	0	0
Connecticut.....	38	66	66	0	0	1	0	1	0	0	0	0
<b>MIDDLE ATLANTIC</b>												
New York.....	121	423	423	0	3	7	0	3	0	0	0	0
New Jersey.....	42	206	206	1	1	0	0	1	0	0	0	0
Pennsylvania.....	141	369	361	0	4	0	0	2	0	0	0	0
<b>E. NO. CEN.</b>												
Ohio.....	80	233	233	0	0	0	3	0	0	0	0	0
Indiana.....	16	72	45	0	0	0	0	0	0	0	0	0
Illinois.....	46	153	124	0	0	0	0	0	0	0	0	0
Michigan <sup>1</sup> .....	120	253	188	0	0	1	0	0	0	0	0	0
Wisconsin.....	63	209	182	0	0	0	0	0	0	0	0	0
<b>W. NO. CEN.</b>												
Minnesota.....	26	54	41	0	0	0	0	0	0	0	0	0
Iowa.....	20	18	15	0	0	0	0	0	0	0	0	0
Missouri.....	10	22	31	0	0	0	1	1	0	0	0	0
North Dakota.....	2	12	4	0	0	0	0	0	0	0	0	0
South Dakota.....	1	1	1	0	0	0	0	0	0	0	0	0
Nebraska.....	19	11	7	0	0	0	0	0	0	0	0	0
Kansas.....	28	61	57	0	0	0	0	1	0	0	0	1
<b>SOUTH ATLANTIC</b>												
Delaware.....	1	1	4	0	0	0	0	0	0	0	0	0
Maryland <sup>2</sup> .....	59	120	72	0	0	0	0	0	0	0	0	0
District of Columbia.....	3	26	15	0	0	0	0	0	0	0	0	0
Virginia.....	74	55	55	0	0	0	26	0	0	0	2	0
West Virginia.....	45	55	46	0	0	0	0	0	0	0	0	0
North Carolina.....	115	163	163	0	0	0	0	0	0	0	0	0
South Carolina.....	61	43	57	0	2	6	0	0	0	0	0	0
Georgia.....	16	36	36	1	0	1	0	0	0	0	7	5
Florida.....	14	32	28	0	1	1	0	0	0	0	0	0
<b>E. SO. CEN.</b>												
Kentucky.....	61	35	51	0	0	0	0	0	0	0	0	0
Tennessee.....	21	122	40	0	0	0	3	0	0	0	1	0
Alabama.....	35	49	31	0	0	0	0	0	0	0	1	4
Mississippi <sup>3</sup> .....				0	0	0	0	0	0	0	0	1
<b>W. SO. CEN.</b>												
Arkansas.....	7	42	11	0	1	2	0	0	0	0	1	0
Louisiana.....	0	8	8	0	2	1	0	0	0	0	0	4
Oklahoma.....	10	23	15	0	0	0	0	1	0	0	0	0
Texas.....	211	420	208	0	11	126	0	3	0	0	0	18
<b>MOUNTAIN</b>												
Montana.....	3	12	10	0	0	0	0	0	0	0	0	0
Idaho.....	8	0	3	0	0	0	0	0	0	0	0	0
Wyoming.....	6	1	3	0	0	0	0	0	0	0	0	0
Colorado.....	24	29	36	0	0	0	0	0	0	0	0	0
New Mexico.....	8	41	16	0	0	0	0	0	0	0	0	0
Arizona.....	31	23	20	0	0	0	19	0	0	0	0	0
Utah <sup>4</sup> .....	20	40	87	0	0	0	0	0	0	0	0	0
Nevada.....	0	0	2	0	0	0	0	0	0	0	0	0
<b>PACIFIC</b>												
Washington.....	55	25	61	0	0	0	0	0	0	0	0	0
Oregon.....	36	10	13	0	0	0	0	0	0	0	0	0
California.....	106	318	286	0	2	5	0	0	1	0	0	1
<b>Total.....</b>	<b>1,948</b>	<b>4,183</b>	<b>4,024</b>	<b>2</b>	<b>27</b>	<b>152</b>	<b>52</b>	<b>13</b>	<b>1</b>	<b>0</b>	<b>12</b>	<b>34</b>
11 weeks.....	20,283	42,972	43,609	10	276	2,184	700	115	7	2	113	451
11 weeks, 1943.....				19	292	2,288	472	115	6	3	190	548

<sup>1</sup> New York City only.

<sup>2</sup> Period ended earlier than Saturday.

<sup>3</sup> Later information shows 62 cases of diphtheria in Texas for the week ended March 11, instead of 26 as previously reported.

<sup>4</sup> The following are corrected cumulative figures for measles, respectively, for the first 7, 8, and 9 weeks of the year: 114,762, 141,835, and 176,073.

<sup>5</sup> Including paratyphoid fever cases reported separately as follows: Indiana, 1; Virginia, 1; Georgia, 1; Texas, 1; Washington, 1; California, 3.

## WEEKLY REPORTS FROM CITIES

City reports for week ended March 4, 1944

This table lists the reports from 86 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Enecephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomylitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
<b>NEW ENGLAND</b>												
<b>Maine:</b>												
Portland.....	0	0	0	0	24	0	5	0	17	0	0	1
<b>New Hampshire:</b>												
Concord.....	0	0	0	0	0	0	2	0	2	0	0	0
<b>Vermont:</b>												
Barre.....	0	0	0	0	0	0	0	0	1	0	0	0
<b>Massachusetts:</b>												
Boston.....	5	0	0	0	90	10	10	0	86	0	0	16
Fall River.....	0	0	0	0	22	0	2	0	3	0	0	1
Springfield.....	0	0	0	0	54	2	0	0	31	0	0	2
Worcester.....	0	0	0	0	0	0	9	0	47	0	0	2
<b>Rhode Island:</b>												
Providence.....	1	1	0	0	259	6	6	0	8	0	0	9
<b>Connecticut:</b>												
Bridgeport.....	0	0	2	0	30	2	0	0	4	0	0	0
Hartford.....	0	0	1	0	2	1	0	0	8	0	0	0
New Haven.....	0	0	0	0	147	3	0	0	6	0	0	6
<b>MIDDLE ATLANTIC</b>												
<b>New York:</b>												
Buffalo.....	0	0	1	1	4	2	9	0	22	0	0	0
New York.....	12	0	10	1	1,658	37	84	0	298	0	0	38
Rochester.....	0	0	0	0	1	3	3	0	7	0	0	2
Syracuse.....	0	0	0	0	1	0	2	0	3	0	0	11
<b>New Jersey:</b>												
Camden.....	0	0	0	0	1	0	2	0	31	0	0	0
Newark.....	0	0	1	1	59	10	4	0	17	0	0	9
Trenton.....	0	0	1	0	6	1	7	0	8	0	0	0
<b>Pennsylvania:</b>												
Philadelphia.....	2	0	5	3	53	12	34	0	86	0	0	15
Pittsburgh.....	0	0	5	5	222	8	25	0	23	0	0	5
Reading.....	0	0	1	1	5	0	3	0	2	0	0	1
<b>EAST NORTH CENTRAL</b>												
<b>Ohio:</b>												
Cincinnati.....	2	0	0	0	44	4	3	0	43	0	0	2
Cleveland.....	0	0	1	0	1,088	9	5	0	61	0	0	18
Columbus.....	0	0	2	2	191	2	1	0	10	0	0	3
<b>Indiana:</b>												
Fort Wayne.....	0	0	0	0	0	0	1	0	2	0	2	0
Indianapolis.....	1	0	1	1	22	8	7	0	84	0	0	10
South Bend.....	0	0	0	0	2	0	0	0	4	0	0	0
Terre Haute.....	1	0	0	0	0	0	3	0	0	0	0	0
<b>Illinois:</b>												
Chicago.....	2	0	3	5	83	29	28	0	190	0	0	9
Springfield.....	0	0	0	0	42	0	6	0	1	0	0	1
<b>Michigan:</b>												
Detroit.....	5	0	3	1	75	12	13	0	90	0	1	7
Flint.....	0	0	0	0	18	0	1	0	2	0	0	1
Grand Rapids.....	0	0	0	0	230	0	1	0	10	0	0	0
<b>Wisconsin:</b>												
Kenosha.....	0	0	0	0	2	1	0	0	4	0	0	1
Milwaukee.....	0	0	2	2	52	6	13	0	94	0	0	23
Racine.....	0	0	0	0	13	0	1	0	3	0	0	7
Superior.....	0	0	0	0	3	0	0	0	24	0	0	0
<b>WEST NORTH CENTRAL</b>												
<b>Minnesota:</b>												
Duluth.....	0	0	0	0	9	0	0	0	20	0	0	12
Minneapolis.....	1	0	1	1	820	1	7	0	58	0	0	3
St. Paul.....	0	0	0	0	572	1	5	0	83	0	0	2

See footnotes at end of table.

City reports for week ended March 4, 1944—Continued

	Diphtheria cases	Etiology, infections, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Pollomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
<b>WEST NORTH CENTRAL—continued</b>												
<b>Missouri:</b>												
Kansas City.....	1	1	3		31	3	15	0	37	0	0	1
St. Joseph.....	0	0	0		0	4	0	0	5	0	0	0
St. Louis.....	0	0	10	1	228	20	14	0	29	0	0	4
<b>Nebraska:</b>												
Omaha.....	2	0	0		0	2	11	0	29	0	0	1
<b>Kansas:</b>												
Topeka.....	0	0	1	1	9	1	3	0	4	0	0	3
Wichita.....	0	0	1	0	243	1	6	0	1	0	0	0
<b>SOUTH ATLANTIC</b>												
<b>Delaware:</b>												
Wilmington.....	0	0		0	6	1	4	0	1	0	0	0
<b>Maryland:</b>												
Baltimore.....	9	0	8	1	706	5	19	0	64	0	1	12
Cumberland.....	0	0		0	0	0	1	0	0	0	0	0
Frederick.....	0	0		0	0	0	0	0	1	0	0	0
<b>District of Columbia:</b>												
Washington.....	0	0	2	0	136	2	9	0	232	0	0	3
<b>Virginia:</b>												
Lynchburg.....	0	0	5	0	13	0	2	0	0	0	0	1
Richmond.....	0	0	2	3	188	4	2	0	8	0	0	0
Roanoke.....	0	0		0	126	0	1	0	2	0	0	1
<b>West Virginia:</b>												
Charleston.....	0	0		0	0	0	0	0	9	0	0	0
Wheeling.....	0	0		0	2	0	0	0	20	0	0	2
<b>North Carolina:</b>												
Winston-Salem.....	0	0	1	0	87	0	1	0	3	0	0	3
<b>South Carolina:</b>												
Charleston.....	0	0	35	0	61	3	2	0	0	0	0	0
<b>Georgia:</b>												
Atlanta.....	0	0	17	0	50	1	3	0	6	0	0	0
Brunswick.....	1	0		0	57	5	1	0	0	0	0	0
Savannah.....	0	0	3	0	4	0	0	0	0	0	0	0
<b>Florida:</b>												
Tampa.....	0	0	1	0	9	0	1	0	1	0	0	1
<b>EAST SOUTH CENTRAL</b>												
<b>Tennessee:</b>												
Memphis.....	0	0	4	1	12	15	2	0	14	0	0	11
Nashville.....	0	0	0	2	3	5	3	0	9	0	0	0
<b>Alabama:</b>												
Mobile.....	0	0	2	0	16	1	3	0	0	0	0	2
<b>WEST SOUTH CENTRAL</b>												
<b>Arkansas:</b>												
Little Rock.....	0	0	2	0	39	0	1	0	1	0	0	2
<b>Louisiana:</b>												
New Orleans.....	3	1	8	3	35	8	6	0	5	0	1	0
Shreveport.....	1	0		1	0	1	7	0	1	0	0	0
<b>Texas:</b>												
Dallas.....	2	0	2	2	85	3	8	0	8	0	0	1
Galveston.....	0	0	16	0	4	0	1	0	1	0	0	0
Houston.....	6	0		0	49	2	10	0	2	0	1	0
San Antonio.....	0	0	2	2	12	1	10	0	0	0	0	0
<b>MOUNTAIN</b>												
<b>Montana:</b>												
Billings.....	0	0		0	3	0	1	0	5	0	0	0
Great Falls.....	2	0	9	0	8	0	1	0	5	0	0	0
Helena.....	0	0		0	1	0	0	0	0	0	0	0
Missoula.....	0	0		0	0	0	1	0	5	0	0	0
<b>Idaho:</b>												
Boise.....	0	0		0	11	0	0	0	10	0	0	0

See footnotes at end of table.

## City reports for week ended March 4, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Pollomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Colorado:												
Pueblo.....	0	0	-----	0	14	0	2	0	2	0	0	3
Utah:												
Salt Lake City.....	0	0	-----	1	2	0	4	0	35	0	0	3
PACIFIC												
Washington:												
Seattle.....	0	0	-----	0	25	2	5	0	20	0	0	11
Spokane.....	0	0	-----	0	45	0	3	0	15	0	0	2
Tacoma.....	32	0	-----	0	6	1	1	0	73	0	0	1
California:												
Los Angeles.....	7	0	-----	25	172	5	14	1	41	0	1	5
Sacramento.....	1	0	-----	0	9	0	0	0	3	0	0	0
San Francisco.....	1	0	-----	0	38	3	5	0	43	0	0	0
Total.....	100	3	-----	191	48	8,460	274	486	1	2,222	0	7
Corresponding week, 1943	55	2	-----	181	37	4,510	167	532	4	1,398	0	8
Average, 1939-43.....	73	-----	616	158	14,309	-----	1,518	-----	1,517	11	18	1,035

<sup>1</sup> 2-year average, 1941-43.

<sup>2</sup> 5-year median.

*Dysentery, amebic.*—Cases: New York, 2; Philadelphia, 5; St. Louis, 1; Baltimore, 1; Los Angeles, 1.  
*Dysentery, bacillary.*—Cases: Providence, 1; Buffalo, 8; New York, 1; Philadelphia, 2; Detroit, 1; St. Louis, 1; Richmond, 2; Charleston, S. C., 3; Los Angeles, 1.  
*Dysentery, unspecified.*—Cases: Baltimore, 1; San Antonio, 4.  
*Tularemia.*—Cases: St. Louis, 1.  
*Typhus fever.*—Cases: Charleston, S. C., 1; Mobile, 1; Houston, 1.

*Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1942, 34,022,600)*

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Pollomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England.....	14.9	2.5	7.5	0.0	1,565	69.8	84.7	0.0	531	0.0	0.0	92
Middle Atlantic.....	6.3	0.0	9.5	5.4	1,899	32.6	77.2	0.0	222	0.0	0.0	36
East North Central.....	6.4	0.0	6.4	6.4	1,082	41.6	49.2	0.0	347	0.0	1.8	45
West North Central.....	7.9	2.0	21.5	11.9	3,792	65.4	121.1	0.0	523	0.0	0.0	52
South Atlantic.....	17.4	0.0	128.5	7.0	2,514	36.5	80.0	0.0	604	0.0	1.7	40
East South Central.....	0.0	0.0	53.5	26.9	278	188.2	71.7	0.0	206	0.0	0.0	117
West South Central.....	35.3	3.0	82.2	23.5	659	44.1	126.5	0.0	529	0.0	5.9	9
Mountain.....	33.0	0.0	145.4	16.5	643	0.0	148.4	0.0	1,022	0.0	0.0	99
Pacific.....	71.9	0.0	43.8	5.3	536	28.0	49.1	1.8	358	0.0	1.8	44
Total.....	15.4	0.5	29.4	7.4	1,300	42.1	74.7	0.2	341	0.0	1.1	45

TERRITORIES AND POSSESSIONS

Hawaii Territory

*Plague (rodent).*—Rats proved positive for plague have been found in Hamakua District, Island of Hawaii, T. H., as follows: Paauehau—January 24, 1944, 1 rat, January 27, 1 rat, February 4, 1 rat; Kapulena—February 2, 1 rat, February 9, 1 rat; Kukuihaele—February 2, 1 rat.

Panama Canal Zone

*Notifiable diseases—January 1944.*—During the month of January 1944, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox.....	10		11		4		1		26	
Diphtheria.....	6	2	1				1		8	2
Dysentery (amebic).....		1					1		1	1
Dysentery (bacillary).....	2				2		2	1	6	1
Leprosy.....								1		1
Malaria <sup>1</sup> .....	13		2		118		56	1	189	1
Measles.....	1		2		66		1		70	
Meningitis, meningococcus.....	1								1	
Mumps.....	10		7		49		2		68	
Paratyphoid fever.....					3				3	
Pneumonia.....		7		3	20			2	20	12
Relapsing fever.....	1						1		2	
Tuberculosis.....		24		5	3	1		9	33	39
Typhoid fever.....							1		1	
Whooping cough.....					9			1	9	1

<sup>1</sup> 62 recurrent cases.

<sup>2</sup> Reported in the Canal Zone only.

# FOREIGN REPORTS

## CANADA

*Provinces—Communicable diseases—Week ended February 19, 1944.*—During the week ended February 19, 1944, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		9		215	343	58	50	113	281	1,069
Diphtheria		7	6	22	1	2				38
Encephalitis, infectious						1				1
German measles		5		50	29	6	15	7	30	142
Influenza		65	1		94	1			43	204
Measles	1	29		662	568	63	76	241	17	1,657
Meningitis, meningococcus				1	4			2	3	10
Mumps	1	29		83	172	79	8	55	56	483
Scarlet fever		12	1	71	191	57	22	87	83	524
Tuberculosis (all forms)		1	1	87	69	14		14	20	206
Typhoid and paratyphoid fever				7	1			1	1	10
Undulant fever					2					2
Whooping cough		7		58	64	14	2	11	25	181

## JAMAICA

*Notifiable diseases—4 weeks ended February 12, 1944.*—During the 4 weeks ended February 12, 1944, cases of certain notifiable 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	Leprosy		8
Chickenpox	7	35	Poliomyelitis		2
Diphtheria	2	3	Puerperal sepsis		1
Dysentery	3	2	Tuberculosis	25	61
Erysipelas		1	Typhoid fever	11	54

## SWEDEN

*Notifiable diseases—November 1943.*—During the month of November 1943, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	9	Poliomyelitis	246
Diphtheria	280	Scarlet fever	3,033
Dysentery	98	Syphilis	141
Encephalitis, epidemic	4	Typhoid fever	8
Gonorrhoea	1,773	Undulant fever	4
Hepatitis, epidemic	943	Weil's disease	9
Paratyphoid fever	14		

## REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

### Plague

*Egypt—Suez.*—During the week ended February 26, 1944, 3 cases of plague with 2 deaths were reported in Suez, Egypt.

### Smallpox

*Egypt—Suez.*—During the week ended February 26, 1944, 18 cases of smallpox with 2 deaths were reported in Suez, Egypt.

*India—Bombay.*—Smallpox continues in epidemic form at Bombay, India. According to official reports for the week ended February 12, 1944, 223 new cases with 102 deaths occurred as compared with 192 cases and 55 deaths reported for the preceding week.

*Indochina (French).*—For the period January 21–31, 1944, 48 cases of smallpox were reported in French Indochina.

*Sudan (French).*—For the period January 11–20, 1944, 165 cases of smallpox with 14 deaths were reported in French Sudan.

*Turkey.*—For the month of December 1943, 1,488 cases of smallpox were reported in Turkey.

### Typhus Fever

*Bulgaria.*—For the period January 6–19, 1944, 80 cases of typhus fever were reported in Bulgaria.

*Guatemala.*—For the month of January 1944, 155 cases of typhus fever with 27 deaths were reported in Guatemala.

*Hungary.*—For the 2 weeks ended February 19, 1944, 121 cases of typhus fever were reported in Hungary.

*Netherlands.*—For the 3 weeks ended January 22, 1944, 5 cases of typhus fever (including 3 cases in Amsterdam) were reported in the Netherlands. For the week ended January 29, 2 cases of typhus fever were reported in Amsterdam.

*Union of South Africa—Cape Province.*—Information dated March 6, 1944, states that official reports indicate a wide prevalence of typhus fever in Transkei region, Cape Province, practically all among the native population, where 282 cases were reported in one week. The principal outbreaks have occurred more than 300 miles from Port Elizabeth. Precautionary measures are being taken by the Government.

### Yellow Fever

*Brazil.*—Deaths from yellow fever have been reported in Brazil as follows: Amazonas State, Benjamin Constant, December 21, 1943, 1 death; Matto Grosso State—Coronel Ponce, January 15, 1944, 1 death; Cuiaba, January 2, 1 death; January 19, 1 death.