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APPLICATION OF THE RAMON FLOCCULATION PRINCIPLE TO THE TITRATION OF SCARLET FEVER STREPTOCOCCUS TOXIN AND ANTITOXIN

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The tests here reported were made to determine the possibility of applying the Ramon [1] flocculation principle to the toxin of a hemolytic streptococcus of scarlatinal origin and to the corresponding antitoxin.

In the first test a series of tubes was prepared in which the first tube contained 1.5 c. c. of toxin and 2.5 c. c. of antitoxin. The toxin was increased in each succeeding tube by 0.1 c. c., while the antitoxin was decreased by a like amount. The last tube contained 2.5 c. c. of toxin and 1.5 c. c. of antitoxin. Between the tube containing 1.9 c. c. of toxin and the tube containing 2.1 c. c. of toxin, extra tubes were added to allow an increase of 0.01 c. c. of toxin for each tube and a corresponding decrease of antitoxin. For the first five hours the tubes were kept in the 37° C. water bath. From the 5th to the 22d hours the tubes were kept in the ice box and then reincubated. Flocculation occurred in some of the tubes after 22 hours.

During the second incubation, flocculation appeared in all of the tubes. The results were too irregular to permit of any reading.

A fresh supply of antitoxin was obtained through the kindness of one of the manufacturers of biologic products. This antitoxin was used throughout the tests reported in the remainder of this paper and is referred to as antitoxin A. Protocol 1 shows the first titration with antitoxin A. The toxin H. L. 2 used in this and in the titration shown in the two subsequent protocols was prepared at the Hygienic Laboratory. In this test the tubes were filled at 11.30 a. m. and placed and kept in the 37° C. water bath until 4.30 p. m.; they were then removed from the bath and placed in the ice box over night and reincubated in the water bath the next day. Hours noted on the protocols count from the time when the tubes were first put in the 37° water bath. One control test was made using the same toxin combined with normal horse serum in similar dilutions and a second control with the same toxin combined with unconcentrated diphtheria antitoxin. Both of the control titrations were negative throughout.

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[1] Ramon, G.: Floculation dans un mélange neutre de toxine-antitoxine diphthérique. C. r. de la Soc. de Biol., Paris, 1922, 86, 661-663.

Protocol 1.—*Overnight storage in ice box*

Toxin H. L. 2	Antitoxin A	29 hours	53 hours	Volume antitoxin / Volume toxin
c. c.	*c. c.*			
0.0	2.0	----------	----------	∞
0.1	1.9	----------	----------	19.0
0.2	1.8	----------	----------	9.0
0.3	1.7	----------	----------	5.7
0.4	1.6	----------	----------	4.0
0.5	1.5	----------	----------	3.0
0.6	1.4	----------	----------	2.3
0.7	1.3	----------	----------	1.86
0.8	1.2	----------	----------	1.50
0.9	1.1	----------	----------	1.22
1.0	1.0	----------	----------	1.00
1.1	0.9	----------	----------	0.82
1.2	0.8	F	F	0.67
1.3	0.7	FF	FF	0.54
1.4	0.6	FFF	FFF	0.43
1.5	0.5	----------	FF	0.33
1.6	0.4	----------	----------	0.25
1.7	0.3	----------	----------	0.176
1.8	0.2	----------	----------	0.111
1.9	0.1	----------	----------	0.053
2.0	0.0	----------	----------	0.0

F: Definite flocculation.
FF: Medium flocculation.
FFF: Strongest flocculation observed.

Using the same toxin and antitoxin, a test was then prepared with the amounts shown in Protocol 2. As it was necessary to measure amounts as small as 0.01 c. c. with greater accuracy than the available apparatus made possible, a micrometer syringe on the same principle as that described by Trevan [2] was improvised.

After preparation of the test as shown in Protocol 2, the tubes were incubated in the water bath at 37° C. for one hour. They were then stored in the ice box overnight and reincubated at 9 o'clock the next morning. The first positive reading was noted at 4 p. m. A second reading was made the following morning after the tubes had been stored in the ice box a second night.

Protocol 2.—*Overnight storage in ice box*

Toxin H. L. 2	Antitoxin A	24 hours	42 hours	50 hours	Volume antitoxin / Volume toxin
c. c.	*c. c.*				
0.86	2.14	----------	----------	----------	2.5
1.13	1.87	----------	----------	----------	1.65
1.33	1.67	----------	----------	----------	1.26
1.5	1.5	----------	----------	----------	1.00
1.64	1.36	----------	FF	FF	0.83
1.75	1.25	----------	FFF	Ppt.[1]	0.71
1.85	1.15	----------	FFF	Ppt.[1]	0.62
1.93	1.07	FF	FFF	Ppt.[1]	0.55
2.00	1.00	FFF	FFF	Ppt.[1]	0.50
2.06	.94	FF	FFF	Ppt.[1]	0.46
2.12	.88	----------	FFF	Ppt.[1]	0.42
2.17	.83	----------	FFF	Ppt.[1]	0.38
2.21	.79	----------	FF	Ppt.[1]	0.36
2.25	.75	----------	----------	FF	0.33
2.29	.71	----------	----------	----------	0.31

[1] Flocculi settled to the bottom of the tube.

[2] Trevan, J. W.: An apparatus for the measurement of small quantities of fluid. Lancet, 1922, 1, 786.

The flocculation resembled very closely the flocculation which occurs in the titration of diphtheria toxin and antitoxin by the Ramon method.

Two tests were then made, in the first of which normal horse serum was substituted for antitoxin A, and in the second unconcentrated diphtheria antitoxin was used. The toxin in both of these tests was H. L. 2. Both tests remained negative.

Protocol 3 shows a repetition of the tests shown in protocol 2. This test was incubated at 37° C. continuously until flocculation appeared.

PROTOCOL 3.—*Continuous incubation*

Toxin H. L. 2	Anti-toxin A	12 hours	12.5 hours	13.5 hours	14 hours	24 hours	Volume antitoxin / Volume toxin
c. c.	c. c.						
0.0	3.0	-----	-----	-----	-----	-----	∞
0.5	2.5	-----	-----	-----	-----	-----	5.0
0.86	2.14	-----	-----	-----	-----	-----	2.5
1.13	1.87	-----	-----	-----	-----	-----	1.65
1.33	1.67	-----	-----	-----	-----	-----	1.26
1.5	1.5	-----	-----	-----	-----	-----	1.00
1.64	1.36	-----	-----	-----	-----	-----	0.83
1.75	1.25	-----	-----	-----	-----	FFF	0.71
1.85	1.15	-----	F	FFF	FFF	Ppt.[1]	0.62
1.93	1.07	-----	FF	FFF	FFF	Ppt.[1]	0.55
2.00	1.00	F	FF	FFF	FFF	Ppt.[1]	0.50
2.06	0.94	-----	F	FF	FFF	Ppt.[1]	0.46
2.12	0.88	-----	-----	-----	-----	Ppt.[1]	0.42
2.17	0.83	-----	-----	-----	-----	Ppt.[1]	0.38
2.21	0.79	-----	-----	-----	-----	FFF	0.36
2.25	0.75	-----	-----	-----	-----	-----	0.33
2.29	0.71	-----	-----	-----	-----	-----	0.31
2.32	0.68	-----	-----	-----	-----	-----	0.29

[1] Flocculi settled to the bottom of the tube.

Protocol 4 shows the titration of a toxin prepared and standardized by the Doctors Dick and kindly furnished by them.

PROTOCOL 4.—*Continuous incubation*

Dick toxin	Anti-toxin A	9.5 hours	10 hours	11 hours	12 hours	13 hours	14 hours	Volume antitoxin / Volume toxin
c. c.	c. c.							
0.0	3.00	-----	-----	-----	-----	-----	-----	∞
1.25	1.75	-----	-----	-----	-----	F	FF	1.40
1.38	1.62	-----	FF	FF	Ppt.[1]	Ppt.	Ppt.	1.17
1.5	1.5	F	FFF	FFF	Ppt.[1]	Ppt.	Ppt.	1.00
1.6	1.4	-----	FF	FF	Ppt.[1]	Ppt.	Ppt.	0.87
1.69	1.31	-----	-----	F	FFF	Ppt.	Ppt.	0.78
1.76	1.24	-----	-----	-----	-----	-----	F	0.70
1.83	1.17	-----	-----	-----	-----	-----	-----	0.64
1.89	1.11	-----	-----	-----	-----	-----	-----	0.59
1.95	1.05	-----	-----	-----	-----	-----	-----	0.54
2.00	1.00	-----	-----	-----	-----	-----	-----	0.50

[1] Flocculi settled to the bottom of the tube.

The Dick toxin had been standardized at 17,500 skin test doses per cubic centimeter. Taking the third tube as the neutral point, the titration indicates that antitoxin A has a neutralizing value of 17,500 S. T. D. per cubic centimeter, ±10 per cent.

SUMMARY

The flocculation test has been applied to the toxin and antitoxin of a hemolytic streptococcus of scarlatinal origin and has given a definite reading which checks, on repeated tests. Comparison of results obtained by the flocculation method of titration and those obtained by skin tests are now being made.

SOME EFFECTS OF HIGH ENVIRONMENTAL TEMPERATURES ON THE ORGANISM

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The purpose of undertaking this research was to obtain a more intimate knowledge of the specific effects of high environmental temperature upon the individual organs and tissues of the body so that the more general effects as observed among men who are compelled to work where the air temperature is abnormally high could be more intelligently interpreted than has heretofore been possible.

The observations of Blagden and Forsythe, in 1775 (1), showed that a man in good health could stand for a period of 15 minutes an exposure to a temperature of 250° F. without feeling any ill effects, or a serious rise in body temperature, while a beefsteak exposed at the same time to the same environment was cooked in 13 minutes. It was also shown, by their experiments as well as by the work of later investigators, that the ability of the body to withstand this high temperature depended on the efficiency of the body in keeping cool by evaporation, and also on the relative humidity and stagnation of the surrounding air. Our experiments have been confined so far to an environment in which the air temperature was high and the relative humidity low, approximating very closely the conditions under which furnace workers are employed. We did not attempt to find the upper limit that a man could continue to live and work under, as investigations have shown that this upper limit varies not only for the different species but for the individuals of that species and on the activities of the individual under exposure (2).

As the internal temperature begins to rise from the zero point in cold-blooded animals, there is a stimulating influence on all vital functions until the optimum of temperature has been reached; but when this optimum has been passed, there is an increased activity in compliance with the laws of chemistry, but at the same time at such a rate as to suggest a too rapid consumption of the organic matter in the body and a consequent deterioration. This increased activity continues only for a short rise in temperature above the optimum, when the functional activities are reduced until finally a coma ensues as the body receives some irreparable injury and death follows. It is the ability of the body to keep this internal temperature within the normal limit by radiation, conduction, and evaporation that determines its power to withstand high temperature. In environment where the air temperature is above the body temperature it must depend entirely on evaporation for its cooling, as any conduction or radiation would be in the reverse direction, i. e., from the air into the body. That such a reversal takes place while the heat-regulating mechanism of the body is functioning normally is doubtful, as probably the evaporating moisture from the body surface absorbs some of its calories from the surrounding medium and increased evaporation takes place, thus preventing the absorption of the heat by the blood.

In connection with radiation it might be said that if our observations while drawing blood from the jugular vein after an hour's exposure to an air temperature of 50° C. were correct it would seem that very high temperature may produce vasoconstriction and a greater viscosity of the blood. If it is so it would follow the theoretical reasoning as to the advantage to the organism if its circulating tissue could be withdrawn from the influence of a very high external temperature.

We decided to use the dog in our experimental work in spite of the objections recognized by us that it had developed a strikingly different method of cooling the body by the evaporation of water from that which has been developed by man. However, a survey of the animals generally used in laboratory studies reveals the fact that with the exception of the horse and, to a certain extent, the monkey, there are no animals whose heat-regulating mechanism resembles that of man. The horse may have been best suited for this study, but we had no means of handling animals of this size and we were compelled to look to the smaller animals. Our results, in spite of this difference in the method of evaporation between man and the dog and its theoretical effect upon blood gases, seem to indicate that any differences are quantitative and that the qualitative changes in the gases which result from exposure to high temperature are the same for the two forms. Aside from this theoretical objection the dogs proved to be as nearly ideal as could be hoped for.

We have centered our attention on the study of a single tissue—the blood—because of the rapidity and accuracy with which it reflects the changes that are taking place in the organism, and because it is the only tissue that can be sampled and leave the animal as nearly normal biologically as it was before the sample was taken. In no case was vivisection or cannulization practiced. The blood was examined as to oxygen content and capacity, the carbon dioxide content and capacity, the sugar, and the total solids, all of these determinations being made as a matter of routine. In a few cases the iron of the blood was determined as a control on the oxygen capacity. In a second series the concentration of the hydrogen ion and the carbon dioxide content were determined routinely, with an occasional determination of lactic acid.

In a third series of experiments the effect of increasing the air movement during an exposure to an air temperature of 50° C. was studied. This was followed by another series to see what effects would be observed if the animal were permitted to drink water freely during the exposure to the increased air movement at 50° C. The temperature of the water supplied the animals was 25° C.

In presenting the data which we have obtained, we are aware that various investigators since the time of Claude Bernard have reported observations on the blood of animals exposed to high temperatures; but it has seemed to us that these results are not only fragmentary but, in some cases, of such doubtful accuracy that a clear-cut interpretation of them is most difficult. The inaccuracy, where it occurs, results not only from faulty chemical technique but frequently from an abnormal condition of the animals, many of which were subjected to anesthesia, which would not only disturb the heat-regulating mechanism but also the general metabolism of the subject. Furthermore, these observations have been made at various times and on various animals, while it was our object to correlate as much data of as many types as would be practicable on a given series of individuals or of one species.

In addition to the data on the blood mentioned above, we have recorded the rectal temperature and the body weight whenever a sample of blood was drawn, and more frequently in certain of the experiments.

Methods

CHEMICAL

(*a*) The carbon dioxide content and the alkali reserve of the blood as represented by the carbon dioxide capacity were determined by the methods of Van Slyke (3). The oxygen content and capacity were determined by the method of Van Slyke and Stadie (4), except that it was found necessary to add three or four drops more of potassium ferricyanide than is suggested by these authors. This may have been due to the fact that we used the product of a different manufacturer. In all of these determinations the old, or short, form of the Van Slyke apparatus was used, as it is considered of sufficient accuracy for comparison work. Our results as obtained in this manner were checked by those obtained with the newer form having the longer stem and water jacket, and the differences found were not sufficient to warrant the added difficulties encountered with the later form. The shorter time required for analysis by the old form was a matter of considerable importance because it was necessary that determinations be made within the short time permitted by the experiment, and all of the determinations were made by a single individual so that the differences due to personal equation would be eliminated.

(*b*) The sugar of the blood was determined by MacLean's (5) method for the use of one cubic centimeter, as modified by Hastings and Hopping (6).

(*c*) The total iron of the blood was occasionally determined as a means of controlling the oxygen determinations. When this was done the method published by Brown (7) was used, except that we found that the colorimeter gave a far more satisfactory means of comparing the colors than did the method described by the author.

(*d*) The lactic acid was determined by the method which we have described elsewhere (8), except that at the suggestion of Dr. Greenwald, the filtrate was extracted with ether to avoid the disturbing influence of the sugar which occurred when the determination was made directly on the Folin filtrate. It is recognized that this method is not specific for lactic acid and that the determination might include other hydroxy acids, but since we were unable to find indications of an increase, we feel that it was sufficient to justify the conclusions which we have drawn.

(*f*) The total solids were determined by drying 1 cubic centimeter of blood to constant weight in an electric oven at a temperature of 110° C. This was done in duplicate in silica crucibles.

(*g*) The hydrogen ion concentration was determined by the method described by Cullen (9). The phosphate solutions which were used as standards of comparison were checked by means of the potentiometer.

PHYSICAL

(*a*) The temperature chamber in which the animals were exposed to the various environmental conditions was constructed of two thicknesses of beaver board, with a 4-inch air space between them. The chamber contained three windows, one at one end, another at one side, and the third on the top. These windows were all 2 feet square, and consisted of two sheets of glass with a 2-inch air space between them. A stove stood at one end, under the window; at the opposite end there was a single wooden door lined with beaver board. The chamber was approximately 4 feet wide by 7 feet long by 7 feet high. The method of heat control and of ventilation was that described by Hastings (10), and it has proved very satisfactory. The temperature of the chamber was controlled by a Roux bimetallic gas regulator. Fresh air was admitted to the chamber by means of several rows of 1-inch holes drilled through the upper part of the door.

Stratification and pockets were prevented by convection currents, as recommended by Hastings, and by use of a 6-inch fan. Thermometers placed in various parts of the chamber showed no stratification or variation in temperature, within one-half of 1° C., while the control throughout the day was within 1°.

The relative humidity within the chamber was determined by the sling psychrometer, and the air movement by means of a Short & Mason anemometer, readings being taken in various parts of the chamber.

The body temperature was taken by rectum with an ordinary certified clinical thermometer, which was left in place for a minimum period of a minute and a quarter.

The respiratory rate was counted by means of a Fitz stethograph recording on a smoked drum with a Marey tambour.

BIOLOGICAL

All of the dogs used in these experiments were adult, short-haired mongrels, varying in weight from 10 to 15 kilograms. They were kept when not actually in use for the experiments, in a kennel on the roof, were maintained in a healthy condition throughout the period of experiments, and were used exclusively for the purpose of the research here reported. Their diet consisted of bread and cooked meat in an amount at least sufficient to maintain their weight. As a matter of fact most of them gained in weight during the course of the experiments. They received no food for a period of 18 hours before beginning each experiment. During this time the dogs were supplied with all the water they wanted to drink. It was always before them.

It was our practice to bring the dogs, which were to be used in an experiment, to the laboratory at least half an hour before actually beginning the work, in order that they might become quiet and somewhat accustomed to conditions and to the personnel of the laboratory before the initial sample of blood was drawn. A rest period of at least two weeks was permitted each dog between experiments to allow recovery from any deleterious effects of the exposure to the high temperatures, or any ill effect resulting from the hemorrhage attendent upon the experiment.

The need of this rest period after an exposure to high environmental temperature has been clearly demonstrated from our own experience in the loss of animals when trying to cut down the time between exposures when only physical measurements were being made and before we realized that some change had taken place in the animal during the last exposure from which it had not yet recovered. In each case the animal was apparently in a normal condition as far as temperature and behavior would indicate. This change may consist in a deterioration in the nervous system, as Goldschneider and

Flatau (11) have shown that the nerve cells in the ventral horn undergo a change in their normal structure after an artificial heating of the animal to 42°–44° C. Barker (12) calls attention to the fact that when the animal has been removed from an environmental temperature of 42° to 44° C. there is a gradual restitution of these cells, but that the rate of repair is not nearly so rapid as the appearance of the function would indicate and that complete recovery requires at least several days. Halliburton and Mott (13) have shown that well-marked changes occur in the Nissl's granules, and that the nerve cells will coagulate if a temperature of 42° C. be maintained for some time. Brecht (14) found that frogs underwent a condition that resembled motor paralysis, from which the animals recovered on cooling if the exposure did not last too long or if the temperature went no higher (34° C. for the frog). It was noticed by him that isolated nerve trunks lost their conductivity and excitability during an exposure, which was regained when the temperature was lowered. Brecht, moreover, claims that when heat paralysis appeared in the skeletal muscle it became permanent. It has been suggested that the high temperature may cause a partial coagulation of the protein in the voluntary and cardiac muscular fibers. Shelford (15), in his work on evaporation, calls attention to the fact that short exposures to high evaporation increase the sensibility to evaporation. In a future paper we hope to bring out some of the histological changes that take place in the tissues under heat exposure,

During the exposure in the heat chamber, the animals were confined in a cage or tied, so that while they had a certain amount of freedom, they could not come in contact with the heater or otherwise injure themselves or the apparatus. At the lower temperatures, their behavior was normal, and they rested quietly or slept, unless disturbed for the purpose of observation. At the higher temperatures of 45° and 50° C. they became restless during the first part of the exposure. This was especially noticeable at 50° C. and an air movement of only 50 to 60 feet per minute. During this period of restlessness the animals were evidently uncomfortable and tried to escape from the cage or chamber. In about half an hour this period of restlessness passed, followed by one of semi-indifference to their surroundings, and they appeared, at times, to be on the threshold of coma. At the end of the hour's exposure they made no effort to move by themselves. This period of indifference lasted for the greater part of an hour after the removal from the heat, but at the end of two hours they appeared to have recovered the use of their faculties.

When the air movement was increased to 224 feet per minute during an exposure of 50° C., the period of increased excitability did not appear during the four hours of exposure. The animals, while perhaps more restless than at the lower temperatures, remained, on the whole, quiet, though there did not seem to be the same tendency to sleep as at the lower temperatures. This nonappearance of the period of great excitability is rather hard to explain, as, after the first hour, there was a definite rise in body temperature, though it did not rise as high as when the air movement was only 50 to 60 feet per minute. The blood gases also showed the same trend at the end of the four-hour exposure as was found at the end of one hour with the same temperature and lower air movement. The animals seemed to be fatigued and lay down quietly for a short time after their removal from the closet, but except in one instance, their recovery from the exposure was fairly rapid, if their behavior could be taken as a standard. In that case the loss in body weight brought about by the increased air movement resulted in the death of the dog within 30 hours after the removal from the heat closet. The dog was unable to stand when removed from the heat closet and seemed partially paralyzed in the hind limbs. It refused all food, drank very little water, and remained in a dazed condition until death. This exception is probably due to the great loss of body fluid, approximating the 10 per cent which Hill (16) claims is the limit of loss for man.

In the next series of experiments, in which the dogs were permitted during an exposure to an air temperature of 50° C. and air movement of 224 feet per minute to drink all the water they desired, the water being set before them every 20 minutes, the animals, after a short period of restlessness, became quiet after the first drink and remained so until the end of the four-hour exposure. When removed from the closet, they showed no apparent signs of fatigue, being from all appearances as fresh as they were when brought into the laboratory.

This period of excitability concomitant with a rise in body temperature has been noted by most of the investigators of the effect of high-air temperature on animals. Man shows the same signs when there is a definite rise in the rectal temperature to 99.5° F. (37.5° C.), at which point there is an abrupt change from sleepiness to wakefulness and irritation. If the rectal temperature of the man under exposure rises to 101°–102° F. (38.36°–38.9° C.) he is no longer capable of mental activities such as reading a book or learning a vocabulary. Sitting in one position is irksome, and the only way of finding comfort seems to be in changing one's position. With the rectal temperature at 103° F. (39.1° C.) any irritation is trying to his temper. This irritability is closely associated with the rise in body temperature and is a warning of an early exhaustion of the central nervous system (17).

SAMPLES

All blood samples were drawn from the jugular vein by venepuncture. The initial values for all animals were averaged and subtracted from corresponding average values at successive periods of time. These deviations are plotted on the graph, the horizontal lines representing the average condition at the beginning of each experiment.

Experimental Results and Discussion

I. THE EFFECT OF VARIOUS ENVIRONMENTAL TEMPERATURES UPON THE BODY TEMPERATURE

The course of the body temperature during the several conditions is shown in Figure 1. The mean temperature of 47 initial observations was 38.7° C. When the animals were kept in the chamber at the ordinary room temperature, 20° C., it was found that the body temperature fell slightly for a time and then remained at a fairly constant level for the remainder of the period of observation. Similar results for man subjected to similar conditions have been reported by the New York State Commission on Ventilation (18). At an environmental temperature of 30° C., the history was much the same, except that the fall was not quite so marked. This last observation is somewhat at variance with the findings of the New York State Commission on Ventilation, as they reported a slight rise in temperature for man exposed to an air temperature of 30° C., but with a relative humidity of 80 per cent, which was much higher than it was in any of our experiments.

Investigations by such men as Jurgensen (19), Richet (20), and Benedict and Snell (21) seem to agree in the main that the minimum temperature of the body is reached between 4 and 6 in the morning and the maximum temperature between 4 and 6 in the evening. The very careful observations by Pembrey and Nichols (22) gave a mean difference in rectal temperature of 1.25 of a degree centigrade between the time of maximum temperature, which they found to be between 4 and 7 in the afternoon, and the minimum, which occurred between 2 and 5 in the morning. They found that these variations could not be taken as the normal limits of temperature, as either muscular work or a warm external temperature would cause a rise above the average maximum temperature.

Observations by Tigerstedt (23) show that while muscular activity may be an important factor in the daily variations in temperature it is not sufficient to explain it entirely. It might be explained as being due to stimulation or cessation of all impulses to the nervous system, which, in return, effects the metabolism of the body. Chossat (24) found that if he awakened the animal during the night, its body temperature rose and soon reached the point that he had observed as being normal for the morning.

It would seem to us that our variation in temperature at these two exposures may be explained by the cessation of nervous stimulation affecting muscular activities, due to the fact that the animal spent most of its time sleeping except when disturbed by us for the purpose of observation.

The work by Rubner (25) is interesting, for he has shown that a temperature of 20° C. is readily borne by the dog without an increase in the rate of metabolism, and that 30° is the temperature of minimum requirement of energy release compatible with mammalian life. Winternitz (26) working with hot baths, also found that a minimal rate of metabolism for the body existed at 30°, for no further drop in metabolism was evident on an exposure to a greater heat. With reference to the lessened activity of the animals, Douglas and Haldane (27) found that man resting in bed consumed 237 c. c. of oxygen per minute; while he was standing at rest the consumption rose to 330 c. c. Such moderate exercise as walking at the rate of 2 miles per hour increased the consumption to 780 c. c. One liter of oxygen produces 4.8 calories in oxidation.

When the temperature of the chamber is raised to 40° C., the response of the organism is quite different. Here we find a rise of 1 degree during the six-hour period of observation, i. e., there was no evidence of the initial fall observed in the other two cases. The temperature remained constant during the middle period, the rise being confined to the first and last two-hour periods. This slight increase may be due to the fact that our wet bulb was nearly 26.6° C. (80° F.). Haldane (28) has observed in man that if he is stripped to the waist and if wet bulb exceeded 31° C. (88) by even 1 degree it resulted in a marked rise in rectal temperature. Our animals might be considered to be in the same condition as a man fully dressed. It is well to note that the legal limit for temperature of cotton weaving sheds in England is 23.9° C. (75° F.) wet bulb.

When the air temperature was raised to 45° C., or to 50° C., a very marked rise in the rectal temperature was noted, and apparently this rise begins at once. In fact it was so sharp that the body temperatures rose within an hour, in some cases to such a height that it was not deemed safe to let the dog remain in the heat chamber for a longer period. On being taken from the heat chamber, the body temperature began to fall rapidly and at the end of two hours, in some instances, to as low as 36° C.; but in every case it was subnormal. This subnormal temperature reminds one of certain stages in cases of heat stroke in man. A peculiarity of this final rise is that the body temperature is sensibly the same for the two environmental temperatures. This is a phenomenon which has been noticed in some of the other factors studied, notably those having to do with carbon dioxide. The organism seems to respond with increasing rapidity as the strain on its regulation mechanism becomes more severe, until a certain limit is reached at which great resistance is interposed by the organism against further change, and if exceeded and left to itself, it then recovers with great difficulty if at all. This type of physiological limitation was noticed by Yandell Henderson and H. W. Haggard (29) during their work on low levels of CO_2 and alkali induced by ether. This critical point was also recognized by Britton (30) in his study on cooling. In order to lower the body temperature of his animals below it, he found it was necessary to subject them to anesthesia until the critical point was passed, after which the anesthesia was no longer necessary and the body temperature continued to fall while the animal was exposed to the low environmental temperature.

When the air movement was increased to 224 feet per minute in our third series of experiments, at an air temperature of 50° C., the body temperature showed very little rise the first hour, amounting only to 0.4° C. By the end of the four-hour exposure it had risen to 41.3° C., or an increase of 2.6° C. This increase in body temperature in spite of the increased air movement is interesting in view of the fact that so much emphasis has been placed lately on air movement. There appears to be no doubt, if we interpret our results correctly, that air movement must be studied from a viewpoint of evaporation. Air movement may delay the discomfort of the organism exposed to high environmental temperatures by keeping the body cool temporarily because of the increased rate of evaporation, but at the expense of the organism itself by lowering the water reserve. That the animal will survive in excellent condition an exposure to high air temperature or movement if the water lost to the organism is replaced concurrently, is shown by our fourth series of experiments. In this series the animals were encouraged to drink all the water that they desired. During the first hour of exposure in this series there was a rise in body temperature of 0.7° C., which is hard to explain, as we had the same air movement and temperature as in the previous series. However, it was not very serious in view of the fact that at the end of the four-hour exposure the animal's temperature was back to what it was at the beginning of the experiment.

II. THE EFFECT OF VARIOUS ENVIRONMENTAL TEMPERATURES UPON THE OXYGEN CONTENT AND UPON THE AMOUNT OF HEMOGLOBIN OF THE BLOOD

Considering first the oxygen capacity (hemoglobin) we find very little change at environmental temperatures of 20° and 30° (Fig. 1). Such small changes as do appear may very probably be related to the diurnal variations in the hemoglobin content which have been shown to take place by Dreyer, Bazett, and Pierce (31) from observations made on man and goat. At temperatures of 40° and above there is a slight tendency for the oxygen to become somewhat more marked as the air temperature increases. This increase is paralleled by an increase in the total solids and we have related it simply to an increase in the concentration of the blood, due to an excessive evaporation of water, accompanied by an inability of the water reservoirs of the body to supply water at a rate sufficient to meet the demand made upon them at these high temperatures. The fact that there was no increase in the oxygen capacity during the first two-hour period of exposure to a temperature of 40° C. would seem to bear out this interpretation; for at this temperature the loss would not be so rapid but that it might be fair to assume that there might be time for equilibration, and that there had not as yet occurred so great a loss that the available store of water had become seriously depleted. The later rise was, then, probably due to an actual depletion of the available water below the limit where the original concentration of the blood could be maintained.

At 45° and 50° it may be presumed that while the actual quantity of water which had been lost from the tissues during the hour of exposure is possibly not serious, the rate of loss is so rapid that the organism is unable to maintain the original concentration of the blood. The rapid return of the oxygen capacity and of the total solids to their original level during the first two hours after the animal was removed from the chamber would tend to support this theory. It is further supported by the results of the third and fourth series. In the third series there is a constant increase in the oxygen capacity paralleling the increase in blood solids which in this case is greater than with the lesser air movement. In the fourth series the oxygen capacity dropped during the exposure, again running parallel with the blood solids which fell as the water lost by the blood due to evaporation was replaced by the water which the dog drank during the exposure.

A very slight fall in the oxygen capacity of the animals exposed to 30° C. is noticed. A comparison of this fall with its mean standard deviation, however, indicates that it is too small to be of significance from the standpoint of statistics.

There is a fairly well-marked fall in the oxygen content of the venous blood (Fig. 1) of animals exposed to a temperature of 30° C. as compared with that of animals exposed to a temperature of 20° C. This, we believe, is a reflection of the manner in which the organism responds to the two environmental temperatures. At 30° C., and with the humidities with which we were working, there appears to be nearly an equilibrium between the heat generated in the basal metabolism and the heat lost to the environment (*Cf.* Voit (32)). The

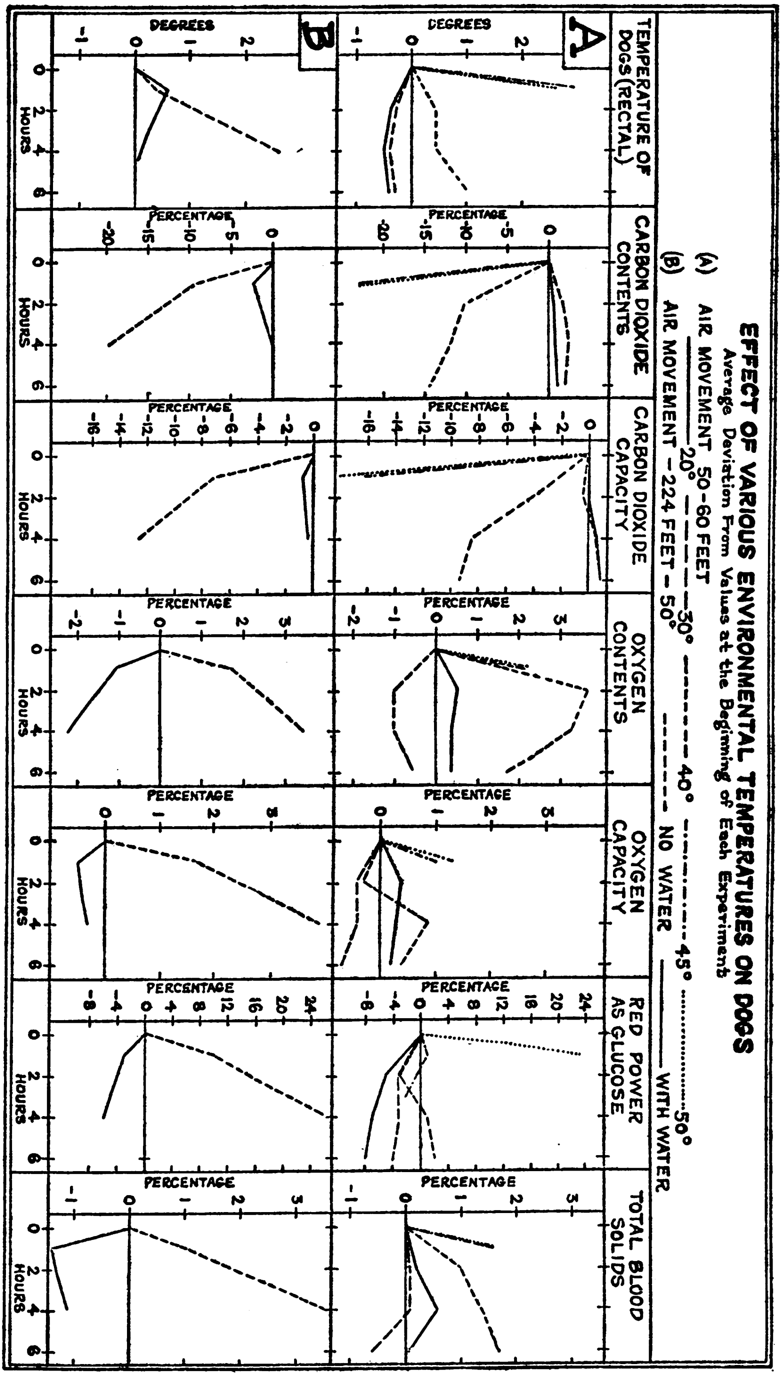
EFFECT OF VARIOUS ENVIRONMENTAL TEMPERATURES ON DOGS
Average Deviation From Values at the Beginning of Each Experiment
(A) AIR MOVEMENT 50-60 FEET
20°
30°
40°
45°
50°
(B) AIR MOVEMENT - 224 FEET - 50°
NO WATER
WITH WATER
A
B
TEMPERATURE OF DOGS (RECTAL)
CARBON DIOXIDE CONTENTS
CARBON DIOXIDE CAPACITY
OXYGEN CONTENTS
OXYGEN CAPACITY
RED POWER AS GLUCOSE
TOTAL BLOOD SOLIDS
DEGREES
PERCENTAGE
HOURS

FIG. 1

animals are quick to take advantage of this and proceed to stretch themselves out and "take life easy." Tachypnea is not necessary to keep the body temperature down. All muscular movement, and consequently heat generation, is at a minimum. The net result is a considerably reduced aeration of the blood, as well as a reduced circulation, and consequently a lower oxygen content.

At 40° C., there is a considerable increase in the rate of respiration, and correlated with this is a rather marked increase in the oxygen content of the blood. The rate of increase in oxygen content is slightly greater at 45° C. and 50° C., but these increases are not nearly so great as might be expected when one compares them with that which occurs between 30° and 40° C. This may be expiained by a study of the results of Schierbecks' (33) observations on man at rest. The results were as follows:

Temperature of air	Water from skin per hour	Carbon dioxide from skin per hour
	Grams	*Grams*
28.4	51.0	0.35
28.9	50.8	.33
29.5	74.3	.33
31.8	110.1	.30
32.7	119.1	.37
33.4	122.3	.80

In the case of man, when the external temperature reaches the critical point, between 33° and 36°, beads of sweat appear and there is a great increase in the discharge of water and carbon dioxide from the skin. It is probable that at about the same critical temperature tachypnea first shows with the dogs.

As the environmental temperature rises, the rate of respiration increases, but at the same time becomes progressively more shallow, so that while the efficiency of the respiratory apparatus as a cooling mechanism may increase because of the increased passage of air over the hyperemic tongue and membrane of the mouth and throat, with a consequent increase of the vaporization of water, its efficiency as a means of aerating the blood does not increase in anything like the same ratio if at all. The rate of metabolism is also raised with the increased body temperature, and this in turn would be reflected in a decreased oxygen content of the venous blood, provided that there is not a considerable increase in the amount carried in the arterial blood. The curves showing the percentage of saturation are very satisfactorily explained by this hypothesis (Fig. 1).

With the increased air movement in the third series we do not get the labored breathing that is so noticeable with the high temperature and lower air movement. The rate of respiration was very similar to that which can be noticed in a dog exposed to the sun on a hot summer day, deep and fairly rapid. The oxygen contents follow the same course as with the lesser air movement.

In the series where water was freely drunk, the oxygen contents dropped from the beginning in the same way that the oxygen capacity did. There has been a growing feeling in our minds that in many of our experiments the oxygen content as well as the oxygen capacity followed the course of the blood solids, and that the increase or decrease is simply due to an increased or decreased amount of hemoglobin, brought about by a concentration of the blood by loss of water for any given percentage hemoglobin saturation. W. Gross and O. Kestner (34), in their work on the influence of muscular activity and perspiration on the blood and tissues, have shown that the increase in hemoglobin concentration is not proportionate to the increase of albumin concentration in the serum.

III. THE EFFECTS OF VARIOUS ENVIRONMENTAL TEMPERATURES UPON THE CARBON DIOXIDE CONTENT AND UPON THE ALKALI RESERVE OF THE BLOOD

There is no change in the alkali reserve of the blood expressed as carbon dioxide content during an exposure of six hours to an air temperature of 20° or 30° C., as is shown by Figure 1, in which it will be seen that the two curves are identical within the limits of the mean standard deviation and that both are horizontal.

When the environmental temperature is raised to 40° C., there is a fairly rapid fall during the first four hours and a somewhat slower fall during the remaining two hours. At 45° and 50° there is a very rapid depletion of the alkali reserve as measured by the carbon dioxide capacity, this depletion being almost identical in degree for the two temperatures. This is a very good illustration of the critical point discussed in connection with the body temperature. We believe that the changes observed result directly from the equilibration necessitated by the washing out of the carbon dioxide brought about by the tachypnea due to high temperature. This tachypnea becomes dyspnea if the exposure is continued over too long a period.

With the increased air movement there is a more gradual depletion of the carbon dioxide capacity extending over the entire four-hour period, though the final results are the same. This slower depletion is directly related to the difference in the rate and type of breathing. As would be expected from the other results discussed, when water was freely drunk the alkali reserve remained on a horizontal line.

The carbon dioxide content (fig. 1) gives a parallel picture, except that there was a slight rise in the animals exposed to the air temperature of 30°. This is probably due to the same cause as the correspondingly slight depression of the oxygen content which was noted for the same condition, i. e., a slight depression in the rate of metabolism which would be as has been shown by Rubner and others at its lowest point under these conditions. This depression would result in a slight decrease in the rate of respiration and circulation.

IV. THE EFFECT OF VARIOUS ENVIRONMENTAL TEMPERATURES UPON THE HYDROGEN ION CONCENTRATION OF THE PLASMA

The hydrogen ion concentration of the plasma expressed as pH remains constant for at least six hours when the animals are exposed to temperatures of 20° and 30° (Table 2) and falls within the normal acid-base balance, or area 5 of Van Slyke's chart (35). At 40°, with an increased rate of respiration and the resultant fall in the carbon dioxide content and the alkali reserve, we find that the blood has passed from area 5 to area 6 of the Van Slyke chart, or into the area of compensated carbon dioxide deficit. The bicarbonate of the blood also falls, thus preventing an abnormal alkalinity. As the strain becomes greater the increasing air temperature to 45° and 50°, the pH increases from the normal of 7.55 to 7.79 and to 7.84 for the two temperatures, respectively. The carbon dioxide content of the plasma has dropped to 29.89 and to 26.53 volumes per cent, respectively, and the plasma has passed into area 2 or 3 of Van Slyke's chart, or that of uncompensated carbon dioxide deficit, as a result of an excessive loss of carbon dioxide. This loss of carbon dioxide was induced by an increase of the respiratory rate, which was evidently brought about by some stimulus other than an increased hydrogen ion concentration of the blood. In the case of man there is a great loss of carbon dioxide through the skin as well as through the respiratory organs. The same condition observed in the dog has been observed by Bazett and Haldane (36), in man when immersed in warm baths. Kahn (37) and Barbour (38) are of the opinion that the mechanism causing the increased rate of respiration is the increased temperature of the blood. Tachypnea seems to be a reflex phenomenon that can result independently of the vagus nerves. Richet (20) observed that when he cut the vagus nerves of a small dog, its respiration became slow and difficult—five respirations per minute; but on placing the animal in an incubator for several hours, the rate of respiration increased to 120 times per minute with the body temperature remaining unaltered. It would seem that after the section of the vagi the dog could maintain its temperature in the same way that any healthy dog exposed to the sun in the summer would by beginning to pant in a few minutes. The causes for the increased breathing are complex and are associated apparently with a rise in body temperature and consequently blood temperature, the quality and quantity of the blood that supplies the respiratory centers in the medulla oblongata, and nerve impulses from many sources, especially the lungs. It is known that cellular activities in general increase, within limits, with the temperature, and there is no apparent reason for excepting the respiratory center from this category.

It was first thought that the stimulus might be due to a local accumulation of hydrogen ion within the cells of the respiratory center itself, which was a part of a general tissue, anoxemia depending upon the increased stability of the oxyhemoglobin at low carbon dioxide tensions (Bohr (39)). If such an anoxemia should in truth exist, one would expect to find it indicated by an accumulation of lactic acid in the blood; but a careful search has failed to show an increase of this acid in the blood of animals exposed to high temperatures over that occurring under normal conditions. It is difficult for us to imagine a significant acidosis occurring in the tissues without being reflected in the blood.

The results of our experiments so far do not warrant our accepting the suggestions of Hill and Flack (40) or of Mayer (41) that the fatal termination from overheating the organism is due to the accumulation of acid; for while it is true that when the animals died as a result of the exposure we found there was some accumulation of carbon dioxide, the same condition prevails when the circulation is in any way interfered with. As we picture it, any excess body temperature due to overheating throws an extra load on the heart, which has to drive the blood through the areas of heat loss in an ever increasing volume. The blood would tend to accumulate in these areas, and, consequently, the brain and other internal organs would receive an inadequate supply (42). Steward (43) has shown that forced breathing will slow down the circulation. In our animals the rate of respiration increased from a normal of 18 to 20 per minute to 380 and more under the extreme conditions studied by us, and with this change in rate it becomes more shallow. Under the strain thrown upon it, the heart becomes progressively more fatigued and would lose its efficiency. Henderson, Barringer, and Harvey (44) showed that an inhibition of the venous pressure occurs whenever the CO_2 content of the blood is diminished by excessive ventilation. A fall in arterial pressure is noticed because of the diminished output of the heart. The apparent cardiac failure is due to the diminution in the pressure and volume in the right heart. It is not easy to say whether the cardiac condition is the cause or the effect of the failure to regulate the temperature. It is well known that men with weak or diseased hearts easily fall victims to heatstroke; on the other hand, the heart is readily injured by a high temperature and a deficient or defective supply of blood (Pembrey and Richie (45)).

Any stagnation of circulation would tend to cause an accumulation of carbon dioxide. It may be that Hill and Flack were led to suspect acidosis from the low carbon dioxide content of the alveolar air; but it seems to us that this might as well be due to the over-ventilation of the lungs which exists under these circumstances. We have noticed a small accumulation of carbon dioxide in the blood of the two dogs which died after exposure to high temperature. In each of these cases the rate of respiration dropped to normal just before death. It may be of some interest to note that at the same time there was a marked increase in the tendency of the blood to coagulate. An analysis of the blood taken ten minutes before death gave the following:

Oxygen content	5. 89
Oxygen capacity	23. 56
Carbon dioxide content	30. 45
Carbon dioxide capacity	36. 71

Yandell Henderson (46) reports the following results on two dogs that died during apnea:

	Arterial blood		Venous blood	
	O_2	CO_2	O_2	CO_2
First dog				
Initial content	23. 9	43. 6	24. 9	46. 2
Fatal content	28. 6	26. 4	5. 8	41. 7
Second dog				
Initial content	15. 9	37. 2	15. 2	39. 4
Fatal content	15. 8	16. 1	0. 0	33. 1

As will be noticed from a study of Van Slyke's chart, the animals which we exposed to the higher temperatures approached, or to be more exact, have reached the upper limit of pH that is compatible with life. We have, however, never seen tonic contraction or other indications of tetany that hydrogen ion concentration of this magnitude is supposed to cause. The nearest approach to it has been an extending of the limbs in a somewhat similar manner to that of the extensor thrust, but it is not in a fixed position.

V. THE RELATION BETWEEN THE CONCENTRATION OF THE SUGAR OF THE BLOOD AND THE TEMPERATURE OF THE BLOOD

The changes in the concentration of the sugar in the blood (Fig. 1) are rather hard to explain in a manner that is consistent for all of the different conditions studied. At 20° there is a fairly uniform fall throughout the six-hour period. This is in entire agreement with the observations of Scott and Hastings (47) and can hardly result from the increased time which has elapsed since the ingestion of food during the course of the experiment, as sufficient time was allowed for this factor to become constant before the first sample was drawn. The only remaining explanation which occurs to us is that the animals are becoming progressively quieter as the experiments proceed, and consequently are mobilizing less and less sugar. Whether such a decrease in the rate of the mobilization of sugar is the direct result of lessened excitement, or whether it is due to the operation of an unknown factor which tends to equilibrate the concentration of sugar in the blood with the metabolic requirements of the organism for sugar, is a matter into which we are unable to enter at the present time. Aside from this factor, which may be assumed, for the time being, to be constant throughout the research, it is to be noted that when corresponding periods in the different series are compared, a rough agreement between the concentration of the sugar of the blood and the body temperature is noted. The series at 45° C. forms an exception to the rule, however, for at this environmental temperature, the temperature of the body is almost identical with that which occurs when the animals are exposed to a temperature of 50° C. while the concentration of sugar occupies a position midway between that found at 40° and that at 50° C. This rise in the sugar of the blood seems to be associated with the environmental temperature, and is not exclusively dependent upon the body temperature and is apparently not dependent upon any emotional disturbances accompanying the exposure to the higher temperature. This seems to be shown by a comparison of the blood concentration found at the exposure to an air temperature of 50° C., with an air movement of only 50 to 60 feet per minute, during the first period of which exposure the animal attempted to escape, with that found with the same temperature but with an air movement of 224 feet per minute, when the animal showed very little excitement. The blood sugar concentration at the end of each exposure was almost identical. When water was freely drunk, the concentration of the blood sugar fell a little.

Sutton (17) found that there was a rise in the respiratory quotient during pyrexia from 0.77 to 0.916, which, using Rubner's table of combustion for fat and carbohydrate, he calculated to be equivalent to an increase in the carbohydrate consumed of five and six times the original amount. Bazett and Haldane (35) found a respiratory quotient of 1.3 in their work with hot baths. Lepine (48) attributes the hyperglycemia occasionally present in fever to an irritation of the fourth ventricle by fever toxins. The increase in concentration of sugar which Freund and Marchand (49) report in fever is only of such a degree as may be accounted for by changes in the concentration of the blood. We are not, however, able to explain our results in this manner since we found the increase in the sugar to exceed that of the total solids; in one case there was an increase of almost 100 per cent in the sugar while at the same time the total solids increased only 25 per cent. It may be that a mechanism exists in the body that mobilizes the sugar at times of great stress, thus protecting the body proteins by means of the well-known protein-sparing action of carbohydrates and fats. Shaffer (50) showed that the ingestion of large amounts of carbohydrate was beneficial to typhoid fever patients in maintaining the nitrogen equilibrium.

VI. THE RELATION BETWEEN THE TOTAL SOLIDS OF THE BLOOD AND THE ENVIRONMENTAL TEMPERATURE

The total solids of the blood tend to increase as the environmental temperature rises, and we have been unable to observe the dilution mentioned by Barbour (51) in the report of his experiments with hot and cold baths, except in the series in which the animals drank freely of water. Our experiments seem to be more in line with the results he reports with coli fever (52). That under some conditions fluid may be drawn into the blood and then lost by excretion without any dilution of the blood was also found by Young, Breinl, Harris, and Osborn (53), who found that there was considerable increase in body temperature under certain tropical conditions of heating.

There is, no doubt, some mechanism in the body by which the total blood volume is regulated, and our results should be considered as indicating a tampering with this mechanism. The water lost to the blood must be replaced, and at high temperatures the replacement can not keep pace with the loss on account of the great drain on the organism. But fortunately there seems to be a good margin of safety; for it is not until the concentration approaches 25 that pathological symptoms seem to appear.

General Remarks on Heat Exposure

The greatest source of danger from heat exposure appears to lie in the organism itself, whose defense rests apparently on a good heart and vaso-motor mechanism for the flushing of the skin and maintaining a sufficient blood pressure, both venous and arterial. Once there is a rise in body temperature, accompanied by excitability, the general metabolism is increased and a vicious circle is inititated. There occurs no compensation by lessened heat production or by increased heat loss with the rise of body temperature. As the internal temperature rises, it appears to gain momentum, and there seems to be no way of stopping this increase outside of removing the animal to a more favorable environment. As far as our observations would indicate, the body has no power of readjusting its general metabolism on a plane of a higher body temperature.

Our results reported in the third series of experiments indicate that an increased air movement may prove temporarily beneficial to the organism if the exposure is not prolonged for too long a period. The benefit of this increased air movement would seem to lie in the fact that it is constantly changing the immediate layer of saturated air that surrounds the body and thus hastens cooling by evaporation. According to the laws of physical equilibrium the pulmonary and cutaneous evaporation increases with the state of dryness of the atmosphere; it becomes almost double when there are 5 grams of water vapor instead of 9 in one cubic meter of air. In short, the value of the elimination of water vapor by the organism varies inversely with the hygrometric state. It would of necessity follow that the higher the relative humidity of the air, the larger must be the volume of circulating air. That an increased air movement alone is not an ideal condition is plainly shown by a comparison of the results of our third and fourth series of observation. Haldane (28) has shown that a man could stand a wet bulb temperature of 34.4° C. without any abnormal rise in rectal temperature provided there was an air movement of 170 linear feet per minute. He made no observations of the blood gases and did not state whether the man drank water freely or not during the exposure.

The benefit of drinking water freely while engaged in any occupation necessitating an exposure to abnormally high temperatures is very apparent. The animals that we lost and which showed a great concentration in the blood were small, and their death can be referred to the fact that their body surface was large in proportion to their volume. Shelford (15) reports most of the symptoms associated with heat exposure in his observations on evaporation, and states that these reactions to evaporation are produced whether the evaporation was by movement, dryness, or heat. Northwag (54) working with the tissues of water-starved birds, came to the conclusion that when death did occur from lack of water it was due to an accumulation of split products in the cells due to a lack of sufficient water to remove them. Such a condition would be rare in a death from heat exposure, as death seems to come before the circulating fluid can be so far depleted as to cause any approach to a condition of water starvation. Hill (16) estimates that a man loses 4.8 per cent of his body weight on a summer's day in 24 hours, and if he is working hard his loss is at the rate of 7.7 per cent. Hunt (55) estimates that a man needs 1,500 c. c. of water per day to satisfy the urine and feces requirements, and up to six liters to neutralize by evaporation the heat added by metabolism. In addition to this he will need a varying amount to neutralize by evaporation the heat added to the body by means of radiation or conduction. Hill warns against the loss in water of 10 per cent of the body weight.

Summary

(1) During an exposure of six hours to an environmental temperature of 20° or 30° C. there was a drop in body temperature, probably due to a decrease in muscular activity. At 40° there was an increase of 1 degree in body temperature without an initial drop. At 45° and at 50° the body temperature rose within an hour to such a height that it was deemed unsafe to continue the experiments.

(2) The oxygen capacity of the blood showed no changes during the exposure to the different temperatures that can not be accounted for by the diurnal changes in the hemoglobin or the concentration of the blood due to excessive evaporation of water.

(3) The oxygen content of the blood remained unchanged at 20°, but showed a drop at 30°, which is probably associated with the low rate of metabolism at this temperature. At 45° and 50° there is a slight increase in the oxygen content, due to the increased aeration of the blood at these temperatures; but this increase is not in direct proportion to the increased passage of air over the membranes of the mouth and throat.

(4) At temperatures of 20° and 30° the alkali reserve remains unchanged, while at 40° there is a sharp fall during the first four hours, followed by a slower fall during the next two hours. At temperatures of 45° and 50° there is a rapid depletion of the alkali reserve from the beginning, which is almost identical for each of these two temperatures.

(5) The carbon dioxide content follows the alkali reserve, except that at 30° there is a slight rise for the same reason that the oxygen content falls.

(6) The hydrogen-ion concentration of the plasma remains unchanged during an exposure of the animal to a temperature of 20°, 30°, and 40°, but decreases at temperatures of 45° and 50°, due to the excessive pulmonary ventilation at those temperatures with the consequent washing out of carbon dioxide without a compensatory loss of alkali from the blood.

(7) The concentration of blood sugar falls during an exposure to temperatures of 20° and 30°. This fall is probably associated with inactivity of the animal during the course of the experiment. At 40° it falls during the first two hours to increase during the following four hours. At 45° no change was noted during an hour's exposure, while at 50° there was a sharp rise during this time.

(8) The blood solids at 20° and 30° showed only the usual diurnal changes. At 40°, 45°, and 50° the concentration of the blood increases with the environmental temperature, no initial drop being seen.

(9) An increased air movement benefits the organism by delaying the deleterious effects, but apparently at the expense of the organism itself.

(10) The free drinking of water during an exposure to high air temperature is of greatest benefit in maintaining the organism in a normal condition.

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APPENDIX—TABLES

TABLE 1.—*Mean results for all experiments*

AIR MOVEMENT 50-60 FEET

	Number of observations	Body weight	Rectal temperature	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity Hb. content	Red power as glucose	Total solid
Chamber temperature, 20°:		*Kg.*	*° C.*	*Vol. %*	*Vol. %*	*Vol. %*	*Vol. %*	*Mg. %*	*%*
Initial	12	16.35	38.9	45.2	67.0	18.4	25.3	92	22.2
Second hour	12	16.30	38.5	45.8	66.9	19.0	25.7	87	22.4
Fourth hour	12	16.27	38.4	46.0	67.6	18.8	25.6	85	22.8
Sixth hour	12	16.25	38.5	46.0	67.9	18.8	25.5	83	22.3
Chamber temperature, 30°:									
Initial	12	16.79	38.8	45.6	62.3	19.4	24.9	95	21.3
Second hour	12	16.77	38.5	47.1	61.9	18.4	24.5	92	21.4
Fourth hour	12	16.74	38.5	48.0	62.8	18.4	24.5	92	21.4
Sixth hour	12	16.69	38.6	47.6	63.2	18.8	24.2	91	20.7
Chamber temperature, 40°:									
Initial	9	14.20	38.6	46.6	62.2	16.3	25.8	82	22.3
Second hour	9	13.96	39.0	36.7	58.2	20.0	25.5	79	23.3
Fourth hour	9	13.63	39.0	34.8	53.8	19.6	26.7	83	23.7
Sixth hour	9	13.43	39.6	33.7	53.0	18.0	26.2	84	24.0
Chamber temperature, 45°:									
Initial	8	14.00	38.6	49.5	59.8	16.6	25.8	88	21.9
First hour	8	13.60	41.5	26.7	43.7	18.7	26.8	89	23.5
Second hour of recovery	8		37.68	45.9	54.3	16.6	25.0	86	22.3
Chamber temperature, 50°:									
Initial	6	14.44	38.9	48.7	57.8	14.7	22.7	85	20.3
First hour	6	14.08	41.54	27.1	39.9	16.9	24.0	108	21.8
Second hour of recovery	6		38.0	46.6	55.5	15.6	22.5	81	20.5
AIR MOVEMENT 224 FEET (NO WATER)									
Chamber temperature, 50°:									
Initial	6	13.85	38.8	45.6	55.8	11.7	19.6	90	18.1
First hour	6	13.6	39.2	36.4	48.3	13.4	21.3	100	19.1
Fourth hour	6	13.0	41.5	25.8	43.1	15.1	23.6	116	21.6
AIR MOVEMENT 224 FEET (WATER GIVEN)									
Chamber temperature, 50°:									
Initial	6	12.6	38.7	41.3	52.7	15.7	20.1	98	20.9
First hour	6	12.63	39.4	39.1	51.9	14.6	19.6	95	19.5
Fourth hour	6	12.65	38.8	41.2	52.3	13.5	19.8	92	19.8

Table 2.—*Showing the effect of various environmental temperatures upon the concentration of the hydrogen ion and carbon dioxide of the plasma*

[Air movement 50-60 feet per minute. Wet bulb and the relative humidity same as in Series I]

Temperature of chamber (centigrade)	Before exposure		After one hour exposure		After six hours exposure	
	pH	CO_2 content	pH	CO_2 content	pH	CO_2 content
20°	7.57	52.4	7.57	52.4	7.57	55.4
40°	7.57	52.4	7.56	46.6	7.56	39.5
45°	7.57	52.4	7.79	29.9	----------	----------
50°	7.57	52.4	7.83	26.3	----------	----------

Table 3

[Exposure 20°; air movement 50-60 feet per minute; average wet bulb., 56; relative humidity 50; time of exposure, 6 hours]

INITIAL

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	46.6	72.57	17.30	22.50	83	----------	10.20	38.77
H	40.7	67.81	21.18	24.19	72	----------	26.10	38.93
J	37.4	67.45	21.20	23.94	71	----------	19.30	39.20
M	49.4	66.95	17.70	23.06	111	21.3	10.90	38.60
P	41.8	68.50	20.69	30.04	96	25.1	15.30	39.22
Q	50.1	63.06	15.68	26.94	94	20.0	15.20	38.88
E	46.6	67.40	17.18	22.83	102	21.7	10.90	38.61
H	44.5	63.34	25.19	29.58	92	24.6	27.00	39.00
J	35.5	64.20	22.50	23.10	96	----------	18.50	39.00
M	52.3	73.22	16.65	19.32	102	20.2	10.70	39.20
P	46.0	66.50	18.77	30.37	92	----------	16.80	38.78
Q	51.8	64.20	16.30	26.90	93	22.7	15.12	38.88
Mean	45.2	67.00	18.40	25.30	92	22.2	16.35	38.92

2 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	37.6	67.4	21.4	23.3	57	----------	10.20	38.78
H	37.3	64.2	18.5	23.3	57	----------	26.10	38.40
J	43.4	67.8	17.4	22.5	87	----------	19.30	38.88
M	51.4	71.1	16.8	24.7	96	22.3	10.80	38.50
P	47.8	68.5	20.7	30.8	115	25.1	15.30	38.34
Q	49.7	63.6	16.5	26.3	86	21.6	15.00	37.77
E	37.9	64.1	22.7	25.1	89	21.3	10.90	38.55
H	42.5	62.6	25.5	32.6	96	25.5	27.00	38.77
J	46.2	69.4	17.2	22.9	92	----------	18.45	39.00
M	52.3	73.2	15.3	19.9	97	20.4	10.70	38.40
P	46.2	66.1	19.2	30.6	95	----------	16.80	38.33
Q	51.5	64.3	16.4	26.9	91	22.3	15.12	38.40
Mean	45.8	66.9	19.0	25.7	87	22.4	16.32	38.50

4 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	46.4	73.0	17.4	22.5	72	----------	10.02	38.33
H	37.2	68.0	18.4	24.3	55	----------	26.10	38.33
J	38.2	64.3	22.7	25.1	88	----------	19.30	38.88
M	50.9	71.6	16.0	24.7	97	20.5	10.80	38.10
P	47.5	68.5	20.7	30.8	105	25.8	15.20	38.33
Q	49.8	63.1	16.4	25.6	87	26.4	15.00	37.77
E	48.0	69.4	14.8	23.2	92	21.3	10.90	38.22
H	44.3	62.6	25.5	29.3	92	23.6	27.00	38.55
J	37.4	67.4	21.3	23.7	55	----------	18.40	39.00
M	48.0	73.2	15.3	19.9	96	20.0	10.70	38.55
P	46.2	66.1	19.1	30.6	93	----------	16.70	38.33
Q	51.8	64.3	16.3	26.9	91	22.5	15.12	38.50
Mean	46.0	67.6	18.8	25.6	85	22.8	16.27	38.40

TABLE 3—Continued

6 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	47.3	73.0	16.9	22.5	68	----------	10.10	38.78
H	36.7	68.0	21.8	24.7	58	----------	26.10	38.33
J	38.9	69.4	21.3	23.1	58	----------	19.30	38.88
M	51.5	71.8	16.7	24.3	92	20.4	10.76	38.10
P	47.8	68.5	21.0	30.8	101	25.5	15.20	38.33
Q	49.8	63.1	16.4	26.6	83	22.7	15.00	37.77
E	48.0	69.4	14.8	22.2	91	21.2	10.70	38.22
H	44.3	62.6	25.5	29.3	91	23.6	27.00	38.55
J	38.1	64.2	22.5	25.1	86	----------	18.40	39.00
M	48.0	73.2	15.3	20.3	97	20.1	10.70	38.55
P	46.2	66.3	19.2	30.6	97	----------	16.70	38.55
Q	51.6	64.4	16.3	26.7	93	22.6	15.10	38.50
Mean	46.2	67.9	18.8	25.5	84	22.3	16.25	38.50

TABLE 4

[Exposure, 30°; air movement 50-60 feet per minute; average wet bulb, 68; relative humidity, 39; time of exposure, 6 hours]

INITIAL

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	41.5	65.8	19.6	23.4	129	21.8	9.91	39.22
E	41.8	53.8	19.9	23.6	92	22.6	11.00	39.00
H	43.9	65.9	22.7	27.0	97	----------	27.10	38.77
H	45.4	57.6	24.9	30.4	90	----------	28.60	39.00
J	44.1	65.8	22.9	24.0	74	----------	19.00	39.20
J	37.6	58.4	23.4	25.6	105	20.8	19.30	38.88
M	54.4	70.7	11.2	17.4	98	17.0	10.56	38.33
M	49.6	57.7	16.5	20.3	90	18.3	11.40	38.33
P	45.7	66.5	22.5	30.4	96	25.1	16.60	38.66
P	44.7	59.9	18.6	26.1	81	22.7	17.20	38.77
Q	48.4	62.6	14.1	25.2	93	21.7	15.62	38.88
Q	49.8	63.1	16.7	26.1	94	21.4	15.20	38.88
Mean	45.6	62.3	19.4	24.9	95	21.3	16.79	38.82
2 HOURS								
E	42.0	65.8	18.1	23.0	141	21.9	9.90	38.77
E	44.6	58.7	16.7	22.8	86	20.8	10.92	38.44
H	45.7	65.9	22.5	26.9	98	----------	27.00	38.44
H	44.4	58.2	24.5	30.4	87	----------	28.60	38.77
J	50.9	60.5	14.9	24.9	74	----------	19.00	39.20
J	42.8	53.3	20.4	23.8	96	20.7	19.25	38.66
M	56.6	70.7	11.2	13.9	97	16.5	10.48	38.33
M	47.7	57.0	16.1	20.3	85	18.3	11.40	38.33
P	45.4	66.8	22.8	30.4	91	25.6	16.55	38.44
P	48.7	59.9	18.6	26.1	85	25.2	17.20	38.33
Q	46.0	62.2	18.2	25.5	82	22.0	15.55	38.44
Q	50.1	63.2	16.9	26.2	87	21.7	15.20	38.33
Mean	47.1	61.9	18.4	24.5	92	21.4	16.77	38.54
4 HOURS								
E	44.5	65.9	17.6	22.1	117	21.1	9.82	38.77
E	48.7	64.8	14.8	22.2	83	22.6	10.88	38.33
H	44.5	66.0	23.9	27.5	98	----------	26.80	38.50
H	44.2	58.2	24.8	30.6	87	----------	28.50	38.66
J	48.3	59.3	20.3	24.8	96	----------	19.00	39.20
J	43.4	60.0	20.4	23.8	96	21.0	19.25	38.77
M	57.2	70.5	9.4	14.2	98	16.1	10.42	38.10
M	47.4	57.6	16.8	20.3	87	20.3	11.40	38.33
P	46.6	66.4	21.4	30.5	85	25.0	16.55	38.33
P	50.4	59.9	19.4	26.1	90	23.6	17.20	38.33
Q	50.3	61.8	14.1	25.8	83	21.8	15.46	38.62
Q	50.1	63.2	16.5	26.2	85	22.0	15.16	37.77
Mean	48.0	62.8	18.4	24.5	92	21.4	16.74	38.46

TABLE 4—Continued

6 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	42.5	65.9	17.6	21.2	132	21.6	9.78	38.88
E	44.6	63.8	14.8	23.2	77	21.9	10.80	38.44
H	43.3	65.9	26.7	27.5	98		26.70	38.66
H	44.3	58.2	24.8	30.7	86		28.50	38.66
J	46.3	62.5	20.3	24.8	87		19.00	39.20
J	46.4	62.6	20.2	22.8	85	19.3	19.25	38.88
M	58.7	70.7	10.9	14.2	91	15.9	10.42	38.33
M	49.0	57.2	16.7	20.6	87	18.2	11.40	38.33
P	45.4	66.6	22.1	30.3	87	24.9	16.50	38.33
P	50.4	59.9	18.5	26.1	90	23.2	17.20	38.44
Q	50.4	62.1	15.9	25.8	87	21.9	15.45	38.33
Q	49.9	63.2	14.9	26.1	85	21.8	15.16	38.23
Mean	47.6	63.2	18.8	24.2	91	20.7	16.69	38.59

TABLE 5

[Exposure, 40°; air movement, 50-60 feet per minute; average wet bulb, 80; relative humidity, 33; time of exposure, 6 hours]

INITIAL

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	38.4	66.5	16.8	23.4	96	22.4	10.48	38.66
E	47.4	64.5	14.9	25.0	93	21.1	11.20	38.33
J	39.0	62.1	18.2	23.6	102	23.6	19.30	39.00
M	48.6	63.4	15.1	23.1	87	19.3	10.66	38.77
M	51.0	59.2	15.0	24.7	87	20.7	11.94	38.44
P	47.9	64.5	15.6	29.4	86	25.4	16.80	38.66
P	49.4	57.6	15.8	28.4	82	23.2	16.60	38.66
Q	51.1	64.8	16.7	23.8	99	22.6	15.20	38.44
Q	46.7	57.2	19.1	26.9	86	22.4	15.92	38.88
Mean	46.6	62.2	16.3	25.8	82	22.3	14.20	38.63

2 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	34.0	58.1	15.7	23.3	79	23.7	10.06	38.77
E	37.5	57.6	15.7	27.2	75	22.2	10.91	38.66
J	26.5	62.1	23.5	25.3	87	22.7	19.00	39.00
M	41.4	65.4	19.7	23.2	81	19.9	10.46	38.66
M	37.7	55.0	16.6	24.5	67	21.1	11.62	39.22
P	35.6	60.0	25.7	30.8	87	25.9	16.52	39.55
P	42.3	55.7	20.3	27.9	81	23.1	16.10	38.88
Q	43.4	60.5	22.1	29.7	86	25.7	15.00	38.88
Q	32.6	49.4	21.2	27.5	73	26.0	15.60	39.44
Mean	36.7	58.2	20.0	25.5	79	23.3	13.90	39.00

4 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	33.5	49.3	17.3	27.9	79	25.0	9.90	38.88
E	37.4	56.6	14.6	27.9	74	22.0	10.71	38.33
J	22.5	49.9	18.1	19.9	103	26.0	18.27	40.00
M	38.8	63.4	18.8	23.1	81	21.5	10.30	38.66
M	36.0	52.8	21.6	25.8	72	23.1	11.44	38.88
P	31.7	53.3	27.3	32.5	82	26.3	16.22	39.61
P	34.0	49.6	20.2	28.3	78	24.2	15.82	39.77
Q	39.3	57.3	18.5	28.8	87	23.0	14.72	38.66
Q	40.3	52.4	20.2	26.6	87	22.6	15.36	38.88
Mean	34.8	53.8	19.6	26.7	83	23.7	13.63	39.00

TABLE 5—Continued

6 HOURS

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
E	31.6	49.3	14.7	26.3	80	23.0	9.68	38.77
E	36.3	55.2	14.7	25.3	74	22.1	10.51	38.88
J	22.5	48.9	16.3	17.2	92	29.4	17.96	42.33
M	40.1	65.0	18.8	23.1	87	22.2	10.24	38.66
M	31.3	46.8	18.0	26.0	86	22.4	11.20	39.44
P	30.7	51.3	21.7	32.5	82	26.7	15.98	40.44
P	30.2	56.1	16.5	30.9	77	22.6	15.56	40.50
Q	38.5	53.7	18.2	27.9	85	24.5	14.52	38.88
Q	42.0	51.0	22.9	26.6	96	23.5	15.22	38.88
Mean	33.7	53.0	18.0	26.2	84	24.0	13.43	39.64

TABLE 6

[Exposure 45°; air movement, 50-60 foot per minute; average wet bulb, 85; relative humidity, 32; time of exposure, 1 hour]

INITIAL

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	51.6	61.8	15.4	24.7	104	21.1	11.26	38.62
M	56.5	68.2	14.6	24.8	99	20.2	12.34	38.44
M	48.3	54.8	13.2	22.2	81	19.6	12.55	38.66
P	48.5	63.6	15.9	28.9	86	23.8	16.28	38.44
P	42.4	56.8	20.4	26.7	69	24.0	17.55	38.88
Q	53.4	58.4	16.5	26.2	96	21.7	15.32	38.66
Q	51.8	58.7	15.7	27.6	89	22.3	15.90	38.77
R	43.3	56.4	21.2	25.1	84	22.4	10.80	38.66
Mean	49.5	59.8	16.6	25.8	88	21.9	14.00	38.63

1 HOUR

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	23.0	43.2	14.2	25.5	90	23.7	10.90	40.33
M	27.2	46.8	18.1	24.0	86	21.1	11.80	41.22
M	32.8	42.7	15.8	20.4	87	21.6	12.30	41.22
P	28.2	46.1	16.5	30.6	98	25.5	15.90	42.20
P	32.9	44.7	20.4	27.6	75	25.3	17.20	41.55
Q	30.8	42.0	18.0	25.5	98	22.9	15.12	41.22
Q	21.5	42.9	23.7	31.2	87	23.9	15.28	41.88
R	17.1	41.2	22.9	29.6	96	24.4	10.32	41.20
Mean	26.7	43.7	18.7	26.8	89	23.5	13.60	41.45

AFTER 2 HOURS' RECOVERY

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
E	38.3	49.7	16.0	24.7	99	24.9	---------	38.33
M	48.5	53.2	11.9	20.9	94	17.8	---------	36.66
M	48.3	58.8	14.9	22.6	93	20.1	---------	36.66
P	45.3	54.7	18.5	27.9	91	24.7	---------	37.77
P	41.8	56.1	20.2	26.7	69	24.2	---------	38.10
Q	51.8	52.4	15.4	24.2	87	21.6	---------	37.77
Q	47.4	51.8	18.4	25.6	93	21.9	---------	37.90
R	46.2	57.4	17.6	27.4	84	23.3	---------	37.44
Mean	45.9	54.3	16.6	25.0	90	22.3	---------	37.56

Table 7

[Exposure 50°; air movement, 50-60 feet per minute; average wet bulb, 88; relative humidity, 28; time of exposure, 1 hour]

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos.	Body temperature
INITIAL								
P	49.0	55.9	15.8	25.7	94	24.01	16.72	39.22
M	47.1	56.3	12.1	17.5	90	16.4	11.42	39.00
Q	53.6	59.7	17.4	24.6	90	21.2	15.64	39.10
P	45.2	55.6	17.1	25.3	69	21.9	16.72	38.33
M	51.9	62.8	10.7	19.8	78	17.8	11.20	38.33
Q	45.4	56.7	15.1	23.2	90	20.4	14.72	39.22
Mean	48.7	57.8	14.7	22.7	85	20.3	14.4	38.86
1 HOUR								
P	30.6	41.9	20.2	22.3	116	23.3	16.45	42.50
M	28.8	32.2	13.4	25.6	108	18.2	11.16	41.20
Q	25.8	42.6	17.4	26.3	117	23.4	15.21	41.77
P	22.8	41.0	19.3	27.4	103	24.1	16.30	42.90
M	27.0	41.1	15.2	19.8	94	20.3	10.90	40.10
Q	27.8	40.8	16.1	22.4	108	21.3	14.36	40.77
Mean	27.1	39.9	16.9	24.0	108	21.8	14.06	41.54
AFTER 2 HOURS' RECOVERY								
P	37.9	46.0	19.8	24.3	90	22.1	----------	38.22
M	50.6	56.9	13.4	18.0	90	16.5	----------	38.10
Q	53.0	56.0	17.4	25.1	81	22.6	----------	37.77
P	43.0	55.3	17.5	25.6	81	23.6	----------	38.44
M	49.8	61.9	11.5	19.8	64	18.1	----------	37.66
Q	45.4	56.7	14.4	22.4	80	20.4	----------	37.77
Mean	46.6	55.5	15.6	22.5	81	20.5	----------	37.99

Table 8

[Exposure, 50°; air movement, 224 feet per minute; average wet bulb, 91; relative humidity, 33; time of exposure, 4 hours]

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
INITIAL								
P	46.4	53.8	7.7	16.7	96	18.1	14.40	38.77
S	47.5	54.4	7.9	16.9	96	18.1	16.40	39.00
U	40.3	59.5	23.9	27.9	91	22.9	9.20	38.88
P	45.4	57.6	11.3	16.7	91	17.9	14.62	38.88
P	47.0	58.3	9.6	15.9	94	16.7	16.50	38.88
M	46.9	51.3	9.5	24.3	74	15.1	12.00	38.77
Mean	45.6	55.8	11.7	19.7	90	18.1	13.85	38.86
1 HOUR								
P	38.3	51.8	9.5	17.6	101	19.5	14.2	39.00
S	38.2	53.5	9.6	17.8	101	19.5	16.2	39.22
U	37.3	48.0	25.6	31.1	105	23.3	8.9	39.22
P	40.3	54.7	12.8	17.6	105	18.6	14.4	39.44
P	33.7	42.8	12.3	15.9	103	16.9	16.3	39.22
M	30.7	41.8	10.6	27.8	83	16.5	11.8	39.22
Mean	36.4	48.8	13.4	21.3	100	19.1	13.6	39.22
4 HOURS								
P	25.0	47.5	14.8	19.3	114	21.7	13.6	41.66
S	25.6	47.7	14.8	19.6	114	21.7	15.6	41.55
U	23.2	48.0	23.8	32.3	114	28.9	8.2	41.20
P	28.0	44.2	12.8	19.4	114	20.4	13.9	41.27
P	28.6	40.8	12.5	16.0	110	17.9	15.7	41.55
M	24.3	30.1	11.4	35.0	132	19.1	11.2	41.66
Mean	25.8	43.1	15.1	23.6	116	21.6	13.0	41.48

TABLE 9

[Exposure 50°; air movement, 224 feet per minute; average wet bulb, 91; relative humidity, 33; time of exposure, 4 hours. Water given]

Dog	CO_2 content	CO_2 capacity	O_2 content	O_2 capacity	Reducing power as glucose	Total blood solids	Weight, kilos	Body temperature
INITIAL								
P	41.1	46.8	11.0	14.5	100	19.5	14.08	38.88
P	44.3	57.6	12.5	18.5	92	19.7	13.90	38.88
U	42.1	57.2	19.8	24.8	94	23.1	10.90	38.62
T	41.7	57.0	18.5	21.8	96	21.4	11.44	38.88
P	36.6	48.1	10.8	16.1	105	18.8	14.35	38.77
U	42.1	49.6	20.8	25.1	98	22.8	10.92	38.44
Mean	41.3	52.7	15.7	20.1	98	20.9	12.59	38.77
1 HOUR								
P	33.3	47.4	12.8	15.9	100	19.3	14.08	40.00
P	44.3	57.6	12.5	18.5	92	18.7	13.93	38.88
U	40.1	57.5	16.6	23.8	94	20.4	10.98	39.66
T	39.8	51.2	18.5	22.1	87	20.1	11.35	40.00
P	36.6	48.0	10.9	14.4	105	17.5	14.55	38.88
U	40.2	49.6	16.0	22.9	89	20.9	11.20	39.22
Mean	39.1	51.9	14.6	19.6	95	19.5	12.68	39.41
4 HOURS								
P	36.4	47.7	10.8	16.9	104	19.2	14.10	38.77
P	41.3	57.6	12.5	18.5	94	19.2	13.90	38.88
U	40.1	57.2	16.6	23.8	94	20.5	10.90	38.88
T	43.2	53.7	18.5	22.4	87	20.1	11.29	39.10
P	38.6	48.1	9.1	14.4	93	18.2	14.45	38.77
U	44.7	49.6	13.4	22.9	78	21.4	11.12	38.88
Mean	41.2	52.3	13.5	19.8	92	19.8	12.62	38.88

HEALTH SECTION OF THE LEAGUE OF NATIONS UTILIZES WIRELESS

The Health Section of the League of Nations has inaugurated a wireless service of health news, with regular weekly messages, from the Far Eastern Bureau at Singapore to headquarters at Geneva. The first message was sent April 3, 1925, and included reports for the week ended March 28, 1925. Two of these messages appear on page 915 of this issue of the Public Health Reports.

DEATHS DURING WEEK ENDED APRIL 18, 1925

Summary of information received by telegraph from industrial insurance companies for week ended April 18, 1925, and corresponding week of 1924. (From the Weekly Health Index, April 22, 1925, issued by the Bureau of the Census, Department of Commerce)

	Week ended April 18, 1925	Corresponding week, 1924
Policies in force	59,446,007	55,677,863
Number of death claims	13,096	10,656
Death claims per 1,000 policies in force, annual rate	11.5	10.0

Deaths from all causes in certain large cities of the United States during the week ended April 18, 1925, infant mortality, annual death rate, and comparison with corresponding week of 1924. (From the Weekly Health Index, April 22, 1925, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Apr. 18, 1925		Annual death rate per 1,000 corresponding week, 1924	Deaths under 1 year		Infant mortality rate week ended Apr. 18, 1925 [2]
	Total deaths	Death rate [1]		Week ended Apr. 18, 1925	Corresponding week, 1924	
Total (64 cities)	7,662	14.5	[3] 14.0	930	[3] 935	
Akron	23			6	5	66
Albany [4]	44	19.2	18.9	1	5	22
Atlanta	82	18.4	19.0	7	6	
Baltimore [4]	246	16.1	14.0	29	16	85
Birmingham	70	17.7	16.9	10	9	
Boston	246	16.4	16.6	36	31	95
Bridgeport	34			3	2	48
Buffalo	163	15.3	15.1	24	30	98
Cambridge	39	18.1	13.5	8	3	138
Camden	48	19.5	18.2	9	9	148
Chicago [4]	745	13.0	12.0	110	104	97
Cincinnati	135	17.2	18.0	6	10	35
Cleveland	198	11.0	12.2	29	24	72
Columbus	64	12.2	14.4	4	11	38
Dallas	54	14.6	13.3	5	6	
Dayton	39	11.8	17.3	8	6	128
Denver	90			10	8	
Des Moines	25	8.7	13.7	1	2	17
Detroit	273			48	46	81
Duluth	26	12.3	11.1	7	5	148
Erie	40			3	2	59
Fall River [4]	43	18.5	11.6	6	6	86
Flint	29			7	5	115
Fort Worth	38	13.0	8.1	3	4	
Grand Rapids	34	11.8	13.0	7	9	109
Houston	43			9	8	
Indianapolis	97	14.1	12.5	1	9	7
Jacksonville, Fla	30	14.9	23.4	1	3	22
Jersey City	73	12.1	14.2	11	9	77
Kansas City, Kans	37	15.6	17.6	5	5	105
Kansas City, Mo	81	11.5	15.9	13	14	
Los Angeles	223			26	31	72
Louisville	86	17.3	18.6	10	7	87
Lowell	35	15.7	11.7	5	4	87
Memphis	68	20.3	22.1	10	10	
Milwaukee	166	17.3	10.9	19	19	87
Minneapolis	121	14.8	12.4	22	20	118
Nashville [4]	34	14.3	20.7	3	4	
New Bedford	34	13.1	7.9	3	5	50
New Haven	42	12.2	10.1	6	1	78
New Orleans	162	20.4	18.0	16	18	
New York	1,628	13.9	13.2	206	211	82
Bronx Borough	176	10.2	11.3	19	19	66
Brooklyn Borough	512	11.9	11.8	70	73	73
Manhattan Borough	757	17.5	15.6	94	101	94
Queens Borough	135	12.3	9.7	15	11	74
Richmond Borough	48	18.7	20.7	8	7	144
Newark, N. J	132	15.2	13.8	17	16	78
Norfolk	37	11.4	11.1	4	2	71
Oakland	63	12.9	12.0	10	6	117
Oklahoma City	19	9.3	9.5	1	4	
Omaha	66	16.3	19.0	8	14	77
Paterson	47	17.3	14.8	7	1	117
Philadelphia	553	14.6	15.0	55	68	69
Pittsburgh	204	16.8	17.4	25	31	88
Portland, Oreg	81	15.0	11.8	9	6	93
Providence	80	17.0	15.6	10	12	80
Richmond	65	18.2	15.6	4	5	49
Rochester	85	13.4		11		87
St. Louis	222	14.1	16.2	20	20	
St. Paul	76	16.1	11.8	7	7	60
Salt Lake City [4]	34	13.5	13.0	1	9	16

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births—an annual rate based on deaths under 1 year for the week and estimated births for 1924. Cities left blank are not in the registration area for births.
[3] Data for 62 cities.
[4] Deaths for week ended Friday, Apr. 17, 1925.

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Deaths from all causes in certain large cities of the United States during the week ended April 18, 1925, infant mortality, annual death rate, and comparison with corresponding week of 1924. (From the Weekly Health Index, April 22, 1925, issued by the Bureau of the Census, Department of Commerce)—Continued.

City	Week ended Apr. 18, 1925		Annual death rate per 1,000 corresponding week, 1924	Deaths under 1 year		Infant mortality rate week ended Apr. 18, 1925
	Total deaths	Death rate		Week ended Apr. 18, 1925	Corresponding week, 1924	
San Antonio	63	16.6	18.5	14	11	
San Francisco	171	16.0	12.3	15	11	86
Schenectady	21	10.7	14.0	0	3	0
Seattle	74			6	5	61
Somerville	18	9.2	10.4	3	1	80
Spokane	27			3	5	65
Springfield, Mass	51	17.4	13.0	4	4	60
Syracuse	47	12.8	14.1	6	8	75
Tacoma	25	12.5	10.1	4	7	95
Toledo	80	14.5	11.3	5	7	45
Trenton	33	13.0	13.3	5	7	81
Utica	45	21.9		4		82
Washington, D. C	159	16.7	13.7	23	15	129
Waterbury	22			4	4	88
Wilmington, Del	30	12.8	17.0	2	7	46
Worcester	64	16.8	15.7	6	4	69
Yonkers	21	9.8	10.0	3	4	66
Youngstown	37	12.1	11.4	6	10	76

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 Week Ended April 25, 1925

ALABAMA

	Cases
Chicken pox	55
Dengue	1
Diphtheria	5
Dysentery	7
Influenza	155
Malaria	50
Measles	17
Mumps	37
Pellagra	25
Pneumonia	98
Scarlet fever	16
Smallpox	129
Tetanus	1
Tuberculosis	71
Typhoid fever	18
Whooping cough	30

ARIZONA

	Cases
Diphtheria	4
Measles	8
Mumps	2
Pneumonia	2
Scarlet fever	5
Trachoma	32
Tuberculosis	4
Whooping cough	3

ARKANSAS

	Cases
Cerebrospinal meningitis	1
Chicken pox	22
Diphtheria	3
Hookworm disease	3
Influenza	133
Malaria	63
Measles	20
Mumps	34
Pellagra	12
Scarlet fever	4
Smallpox	17
Tuberculosis	17
Typhoid fever	13
Whooping cough	23

CALIFORNIA

	Cases
Cerebrospinal meningitis—Fresno	2
Diphtheria	102
Influenza	36
Lethargic encephalitis:	
Los Angeles	2
Oakland	1
Scattering	1
Measles	105
Poliomyelitis:	
Los Angeles	5
Los Angeles County	2
National City	2
Oakland	1
San Bernardino	1
Scarlet fever	120
Smallpox:	
Long Beach	10
Los Angeles	47
Los Angeles County	9
Monterey County	10
Oakland	14
Riverside County	14
San Diego	9
San Francisco	17
Scattering	47
Typhoid fever	10

COLORADO

(Exclusive of Denver)

	Cases
Chicken pox	18
Diphtheria	14
Measles	2
Mumps	9
Pneumonia	3
Scarlet fever	24
Smallpox	2
Tetanus	1
Tuberculosis	21
Typhoid fever	3
Whooping cough	9

CONNECTICUT

	Cases
Chicken pox	24
Conjunctivitis (infectious)	1
Diphtheria	24
German measles	28
Influenza	17
Measles	89
Mumps	11
Pneumonia (all forms)	63
Poliomyelitis	2
Scarlet fever	81
Septic sore throat	6
Trichinosis	1
Tuberculosis (all forms)	47
Typhoid fever	1
Whooping cough	91

DELAWARE

	Cases
Chicken pox	1
Diphtheria	5
Measles	14
Mumps	5
Pneumonia	1
Scarlet fever	6
Tuberculosis	3
Whooping cough	2

FLORIDA

	Cases
Cerebrospinal meningitis	1
Chicken pox	12
Diphtheria	4
Influenza	7
Malaria	12
Measles	2
Mumps	73
Pneumonia	6
Poliomyelitis	2
Scarlet fever	7
Smallpox	3
Tetanus	1
Tuberculosis	23
Typhoid fever	15
Whooping cough	9

GEORGIA

	Cases
Chicken pox	58
Conjunctivitis (acute)	3
Diphtheria	13
Dysentery	29
Hookworm disease	5
Influenza	214
Leprosy	1
Malaria	42
Measles	20
Mumps	87
Pellagra	17
Pneumonia	75
Scarlet fever	5
Septic sore throat	9
Smallpox	11
Tuberculosis	25
Typhoid fever	10
Whooping cough	34

ILLINOIS

	Cases
Cerebrospinal meningitis:	
Du Page County	1
Hardin County	1
St. Clair County	1
Winnebago County	1
Diphtheria:	
Cook County	67
Scattering	24
Influenza	55
Lethargic encephalitis:	
McDonough County	1
Richland County	1
Measles	1,641
Pneumonia	419
Scarlet fever:	
Cook County	301
Madison County	13
Ogle County	8
Peoria County	8
Sangamon County	9
Stephenson County	14
Scattering	98
Smallpox:	
Madison County	13
Union County	11
Scattering	31
Tuberculosis	235
Typhoid fever	18
Whooping cough	405

INDIANA

	Cases
Chicken pox	62
Diphtheria	33
Influenza	80
Measles	148
Mumps	5
Pneumonia	13
Scarlet fever:	
Elkhart County	15
Lake County	17
St. Joseph County	11
Vanderburgh County	12
Vigo County	11
Washington County	16
Scattering	94
Smallpox	70
Tuberculosis	34
Typhoid fever	8
Whooping cough	22

IOWA

	Cases
Diphtheria	26
Scarlet fever	25
Smallpox	20

KANSAS

	Cases
Cerebrospinal meningitis	1
Chicken pox	87
Diphtheria	13
Dysentery (amebic)	1
German measles	1
Influenza	30
Measles	18
Mumps	214
Pneumonia	51
Scarlet fever	117
Smallpox	9
Tuberculosis	43
Typhoid fever	3
Whooping cough	15

LOUISIANA

	Cases
Diphtheria	13
Dysentery (epidemic)	1
Hookworm disease	7
Influenza	37
Malaria	13
Pellagra	9
Pneumonia	52
Scarlet fever	17
Smallpox	25
Tuberculosis	32
Typhoid fever	19
Whooping cough	13

MAINE

Cerebrospinal meningitis	1
Chicken pox	20
Diphtheria	1
German measles	3
Influenza	83
Measles	26
Mumps	88
Paratyphoid fever	4
Pneumonia	16
Scarlet fever	17
Tuberculosis	13
Typhoid fever	1
Whooping cough	3

MARYLAND [1]

Chicken pox	90
Diphtheria	31
Dysentery	1
German measles	6
Influenza	73
Measles	38
Mumps	107
Ophthalmia neonatorum	1
Pneumonia (all forms)	117
Scarlet fever	66
Smallpox	2
Tetanus	2
Tuberculosis	75
Typhoid fever	6
Whooping cough	97

MASSACHUSETTS

Cerebrospinal meningitis	1
Chicken pox	142
Conjunctivitis (suppurative)	17
Diphtheria	91
German measles	220
Hookworm disease	1
Influenza	34
Measles	1,093
Mumps	66
Ophthalmia neonatorum	30
Pneumonia (lobar)	143
Scarlet fever	270
Septic sore throat	2
Tuberculosis (all forms)	139
Typhoid fever	11
Whooping cough	127

MICHIGAN

	Cases
Diphtheria	61
Measles	240
Pneumonia	152
Scarlet fever	364
Smallpox	16
Tuberculosis	99
Typhoid fever	4
Whooping cough	139

[1] Week ended Friday.

MINNESOTA

Cerebrospinal meningitis	1
Chicken pox	70
Diphtheria	56
Influenza	6
Lethargic encephalitis	1
Measles	20
Pneumonia	2
Poliomyelitis	1
Scarlet fever	253
Smallpox	25
Tuberculosis	98
Typhoid fever	1
Whooping cough	19

MISSISSIPPI

Diphtheria	4
Scarlet fever	6
Smallpox	18
Typhoid fever	16

MISSOURI

(Exclusive of Kansas City)

Cerebrospinal meningitis	1
Chicken pox	68
Diphtheria	70
Influenza	21
Malaria	4
Measles	24
Mumps	56
Pneumonia	19
Scarlet fever	261
Septic sore throat	3
Smallpox	2
Tuberculosis	72
Typhoid fever	6
Whooping cough	25

MONTANA

Cerebrospinal meningitis	1
Chicken pox	9
Diphtheria	6
German measles	70
Influenza	3
Measles	11
Mumps	17
Pneumonia	3
Rocky Mountain spotted fever:	
Delphia	1
Myers	1
Scarlet fever	43
Smallpox	7
Tuberculosis	2
Typhoid fever	1

NEBRASKA

Chicken pox	21
Diphtheria	14
Influenza	13

NEBRASKA—continued

	Cases
Mumps	3
Pneumonia	1
Scarlet fever	25
Smallpox	35
Tuberculosis	3
Typhoid fever	1
Whooping cough	8

NEW JERSEY

Cerebrospinal meningitis	1
Chicken pox	142
Diphtheria	67
Influenza	17
Measles	388
Pneumonia	158
Scarlet fever	247
Smallpox	13
Typhoid fever	7
Whooping cough	272

NEW MEXICO

Cerebrospinal meningitis	1
Chicken pox	6
Conjunctivitis	1
German measles	1
Influenza	161
Measles	14
Mumps	15
Pneumonia	3
Scarlet fever	13
Septic sore throat	1
Tuberculosis	23
Typhoid fever	2
Whooping cough	9

NEW YORK

(Exclusive of New York City)

Cerebrospinal meningitis	1
Diphtheria	76
Influenza	73
Lethargic encephalitis	1
Measles	692
Pneumonia	381
Poliomyelitis	1
Scarlet fever	318
Smallpox	1
Typhoid fever	14
Whooping cough	219

NORTH CAROLINA

Chicken pox	114
Diphtheria	19
German measles	1
Measles	14
Ophthalmia neonatorum	1
Scarlet fever	31
Septic sore throat	4
Smallpox	110
Trachoma	1
Typhoid fever	5
Whooping cough	104

OKLAHOMA

(Exclusive of Oklahoma City and Tulsa)

Cerebrospinal meningitis—Washington County	1
Chicken pox	27

OKLAHOMA—continued

	Cases
Diphtheria	10
Influenza	93
Mumps	21
Pneumonia	50
Scarlet fever:	
Washington County	13
Scattering	9
Smallpox	10
Typhoid fever	3
Whooping cough	25

OREGON

Cerebrospinal meningitis	3
Chicken pox	26
Diphtheria:	
Portland	16
Scattering	12
Influenza	75
Measles	4
Mumps	20
Pneumonia	9
Scarlet fever	20
Septic sore throat	1
Smallpox	11
Tuberculosis	30
Typhoid fever	1
Whooping cough	24

SOUTH DAKOTA

Chicken pox	4
Diphtheria	1
Poliomyelitis	1
Scarlet fever	30
Smallpox	2
Whooping cough	1

TEXAS

Cerebrospinal meningitis	3
Chicken pox	43
Dengue	2
Diphtheria	11
Dysentery (epidemic)	1
Influenza	138
Measles	5
Mumps	27
Ophthalmia neonatorum	1
Pellagra	13
Pneumonia	22
Scarlet fever	12
Smallpox	46
Trachoma	2
Tuberculosis	27
Typhoid fever	13
Whooping cough	37

VERMONT

Chicken pox	8
Diphtheria	2
Measles	8
Mumps	42
Scarlet fever	10
Typhoid fever	1
Whooping cough	3

VIRGINIA

Lethargic encephalitis—Augusta County	1
Smallpox—Prince Edward County	1

WASHINGTON

Cerebrospinal meningitis:	Cases
Pierce County	1
Spokane	1
Chicken pox	101
Diphtheria	24
German measles	48
Measles	4
Mumps	146
Scarlet fever	23
Smallpox	47
Tuberculosis	21
Typhoid fever	5
Whooping cough	145

WEST VIRGINIA

Diphtheria	3
Scarlet fever	26
Smallpox	5
Typhoid fever	4

WISCONSIN

Milwaukee:	Cases
Chicken pox	34
Diphtheria	16
German measles	218
Influenza	4
Measles	245
Mumps	94
Ophthalmia neonatorum	1
Pneumonia	45

WISCONSIN—continued

Milwaukee—Continued	Cases
Poliomyelitis	1
Scarlet fever	26
Smallpox	12
Tuberculosis	53
Whooping cough	26
Scattering:	
Chicken pox	104
Diphtheria	29
German measles	268
Influenza	385
Measles	204
Mumps	284
Pneumonia	36
Scarlet fever	124
Smallpox	16
Tuberculosis	27
Typhoid fever	7
Whooping cough	52

WYOMING

Chicken pox	5
Diphtheria	3
Influenza	1
Measles	16
Mumps	21
Pneumonia	1
Rocky Mountain spotted fever	4
Scarlet fever	4
Whooping cough	6

Reports for Week Ended April 18, 1925

DISTRICT OF COLUMBIA

	Cases
Chicken pox	22
Diphtheria	5
Influenza	1
Measles	47
Pneumonia	38
Scarlet fever	30
Smallpox	6
Tuberculosis	27
Whooping cough	8

MAINE [1]

Cerebrospinal meningitis	3
Chicken pox	73
Diphtheria	8
Dysentery	2
German measles	4
Influenza	760
Measles	51
Mumps	259
Pneumonia	56
Poliomyelitis	5
Scarlet fever	56
Septic sore throat	1
Tuberculosis	27
Typhoid fever	7

[1] Reports for weeks ended Apr. 11 and 18, 1925.

MAINE [1]—continued

	Cases
Vincent's angina	4
Whooping cough	13

NEBRASKA

Chicken pox	13
Diphtheria	11
Influenza	53
Measles	5
Mumps	25
Pneumonia	1
Scarlet fever	18
Smallpox	22
Tuberculosis	2
Whooping cough	10

NORTH DAKOTA

Chicken pox	10
Diphtheria	7
Influenza	2
Measles	2
Mumps	8
Pneumonia	20
Scarlet fever	32
Smallpox	3
Trachoma	1
Tuberculosis	1
Whooping cough	44

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Cerebrospinal meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February, 1925										
California	4	542	444	5	186	0	12	618	704	27
Utah	6	39	30		39			62	18	1
March, 1925										
Arkansas	2	19	1,790	171	146	48	0	30	31	46
Delaware		10	9	4	7			23		
Idaho		5	7					27		6
Iowa		41			16			132	40	2
Kansas	5	114	458	0	47	1	2	596	44	10
Maine	0	24	501	0	50	0	1	162	0	11
Maryland	4	137	289	0	159	0	0	336	2	27
Mississippi		71	17,359	3,196	788	496	2	21	155	91
New Jersey	10	393	162		1,057		4	1,303	41	46
North Carolina	4	130			276			100	250	12
North Dakota		17	1		9		1	273	36	3
Ohio	10	406	278	0	959	0	2	2,338	576	46
Oregon	12	115	620		20		1	100	96	9
Rhode Island	2	39	26	1		0	0	118	1	2
South Dakota	1	32	24		10		1	213	47	9
Virginia	7	113	6,187	77	644	4	5	191	22	40
Wyoming		1	3		30			29	6	32

PLAGUE-ERADICATIVE MEASURES IN THE UNITED STATES

The following items were taken from the reports of plague-eradicative measures from the cities named for the week ended April 11, 1925:

Los Angeles, Calif.

Week ended Apr. 11, 1925:
- Number of rats examined 5,123
- Number of rats found to be plague-infected 4
- Number of squirrels examined 921
- Number of squirrels found to be plague-infected 0

Totals, Nov. 5, 1924, to Apr. 11, 1925:
- Number of rats examined 81,604
- Number of rats found to be plague-infected 173
- Number of squirrels examined 7,504
- Number of squirrels found to be plague-infected 9

Date of discovery of last plague-infected rodent, Apr. 23, 1925.
Date of last human case, Jan. 15, 1925.

Oakland, Calif.

(Including other East Bay communities)

Week ended Apr. 11, 1925:
- Number of rats trapped 2,675
- Number of rats found to be plague-infected 0

Totals, Jan. 1 to Apr. 11, 1925:
- Number of rats trapped 35,257
- Number of rats found to be plague-infected 21

Date of discovery of last plague-infected rat, Mar. 4, 1925.
Date of last human case, Sept. 10, 1919.

New Orleans, La.

Week ended Apr. 11, 1925:

Number of vessels inspected	403
Number of inspections made	1, 066
Number of vessels fumigated with cyanide gas	36
Number of rodents examined for plague	5, 062
Number of rodents found to be plague-infected	0

Totals, Dec. 5, 1924, to Apr. 11, 1925:

Number of rodents examined for plague	75, 573
Number of rodents found to be plague-infected	12

Date of discovery of last plague-infected rat, Jan. 17, 1925.

Date of last human case occurring in New Orleans, Aug. 20, 1920.

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

Diphtheria.—For the week ended April 11, 1925, 33 States reported 1,215 cases of diphtheria. For the week ended April 12, 1924, the same States reported 1,617 cases of this disease. One hundred and four cities, situated in all parts of the country and having an aggregate population of more than 28,800,000, reported 875 cases of diphtheria for the week ended April 11, 1925. Last year for the corresponding week they reported 1,001 cases. The estimated expectancy for these cities was 971 cases. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Measles.—Twenty-eight States reported 4,265 cases of measles for the week ended April 11, 1925, and 16,042 cases of this disease for the week ended April 12, 1924. One hundred and four cities reported 2,932 cases of measles for the week this year and 6,236 cases last year.

Scarlet fever.—Scarlet fever was reported for the week as follows: 33 States—this year, 3,576 cases; last year, 3,749; 104 cities—this year, 2,026; last year, 1,795; estimated expectancy, 1,059 cases.

Smallpox.—For the week ended April 11, 1925, 33 States reported 693 cases of smallpox. Last year for the corresponding week they reported 1,435 cases of smallpox. One hundred and four cities reported smallpox for the week as follows: 1925, 282 cases; 1924, 536 cases; estimated expectancy, 111 cases. These cities reported 19 deaths from smallpox for the week this year.

Typhoid fever.—One hundred and seventy-seven cases of typhoid fever were reported for the week ended April 11, 1925, by 32 States. For the corresponding week of 1924 the same States reported 213 cases. One hundred and four cities reported 53 cases of typhoid fever for the week this year and 52 cases for the corresponding week last year. The estimated expectancy for these cities was 51 cases.

Influenza and pneumonia.—Deaths from influenza and pneumonia (combined) were reported for the week by 104 cities as follows: 1925, 1,231 deaths; 1924, 1,316 deaths.

City reports for week ended April 11, 1925

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence how many cases of the disease under consideration may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding week of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1915 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviations from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	73,129	8	1	1	0	0	0	39	7
New Hampshire:									
Concord	22,408	0	1	0	0	0	0	0	2
Vermont:									
Barre	[1] 10,008	0	0	0	0	0	0	6	0
Burlington	23,613	9	1	1	0	0	8	38	0
Massachusetts:									
Boston	770,400	24	59	36	15	4	344	9	38
Fall River	120,912	3	3	2	5	2	0	0	3
Springfield	144,227	8	4	3	2	1	9	3	3
Worcester	191,927	8	5	4	2	1	10	0	9
Rhode Island:									
Pawtucket	68,799	3	1	1	0	0	0	0	4
Providence	242,378	0	11	8	2	3	2	0	5
Connecticut:									
Bridgeport	[1] 143,555	0	7	8	1	1	0	0	3
Hartford	[1] 138,036	1	7	4	6	1	1	1	7
New Haven	172,967	9	4	0	0	0	41	0	4
MIDDLE ATLANTIC									
New York:									
Buffalo	536,718	10	13	10	-------	2	201	3	23
New York	5,927,625	188	242	271	57	19	159	44	219
Rochester	317,867	8	5	12	-------	1	42	21	7
Syracuse	184,511	1	6	5	3	1	7	4	8
New Jersey:									
Camden	124,157	11	4	3	0	0	50	0	2
Newark	438,699	16	18	15	19	0	45	5	18
Trenton	127,390	0	5	1	1	0	0	0	3
Pennsylvania:									
Philadelphia	1,922,788	47	71	103	0	0	331	18	55
Pittsburgh	613,442	14	19	14	-------	8	408	19	39
Reading	110,917	8	2	0	0	0	101	4	1
Scranton	140,636	0	3	4	0	0	1	0	6
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	406,312	9	9	3	-------	7	0	4	22
Cleveland	888,519	75	24	16	5	2	7	8	32
Columbus	261,082	4	4	4	-------	5	5	6	12
Toledo	268,338	9	3	2	-------	3	84	0	2
Indiana:									
Fort Wayne	93,573	6	2	0	-------	1	9	0	2
Indianapolis	342,718	15	8	2	-------	3	4	6	17
South Bend	76,709	1	1	1	0	0	0	0	1
Terre Haute	68,939	1	1	0	-------	1	6	0	3
Illinois:									
Chicago	2,886,121	55	102	48	51	14	572	24	80
Cicero	55,968	-------	2	-------	-------	-------	-------	-------	-------
Springfield	61,833	10	1	1	2	0	0	46	5
Michigan:									
Detroit	995,668	31	51	37	10	2	22	6	36
Flint	117,968	3	4	2	0	0	15	1	5
Grand Rapids	145,947	7	3	1	5	1	52	1	3

[1] Population Jan. 1, 1920.

City reports for week ended April 11, 1925—Continued

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued									
Wisconsin:									
Madison	42,519	2	1	0	0	0	4	41	0
Milwaukee	484,595	22	14	12	2	0	205	64	37
Racine	64,393	3	1	3	0	0	44	18	1
Superior	[1] 39,671	2	1	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	106,289	0	1	0	0	0	0	0	6
Minneapolis	409,125	36	14	23	--------	4	3	0	21
St. Paul	241,891	9	14	14	0	0	8	6	15
Iowa:									
Davenport	61,262	2	1	1	0	--------	0	1	--------
Sioux City	79,662	1	2	0	0	--------	0	9	--------
Waterloo	39,667	12	0	0	0	--------	0	3	--------
Missouri:									
Kansas City	351,819	19	7	0	8	8	3	18	29
St. Joseph	78,232	2	1	0	--------	2	0	1	11
St. Louis	803,853	23	39	66	6	2	11	5	--------
North Dakota:									
Fargo	24,841	2	1	0	0	0	0	9	0
Grand Forks	14,547	0	0	0	0	--------	0	0	--------
South Dakota:									
Aberdeen	15,829	0	--------	0	0	--------	0	0	--------
Sioux Falls	29,206	0	1	0	0	0	0	0	0
Nebraska:									
Lincoln	58,761	8	2	1	0	0	1	2	2
Omaha	204,382	7	4	3	0	0	1	0	18
Kansas:									
Topeka	52,555	4	1	2	--------	1	0	97	3
Wichita	79,261	20	1	1	0	0	2	4	1
SOUTH ATLANTIC									
Delaware:									
Wilmington	117,728	0	2	2	0	0	5	0	0
Maryland:									
Baltimore	773,580	88	25	12	17	4	8	66	47
Cumberland	32,361	--------	1	0	2	1	0	--------	1
Frederick	11,301	0	0	0	--------	1	0	0	2
District of Columbia:									
Washington	[1] 437,571	13	10	11	0	0	37	0	15
Virginia:									
Lynchburg	30,277	7	0	1	0	0	0	37	3
Norfolk	159,089	16	1	0	0	0	8	74	5
Richmond	181,044	0	2	0	0	0	0	0	8
Roanoke	55,502	5	1	1	--------	2	9	1	2
West Virginia:									
Charleston	45,597	3	1	0	0	0	25	1	2
Huntington	57,918	2	1	0	0	--------	0	0	--------
Wheeling	[1] 56,208	4	2	0	0	0	5	2	5
North Carolina:									
Raleigh	29,171	4	1	1	0	0	0	0	1
Wilmington	35,719	2	0	1	0	0	1	1	0
Winston-Salem	56,230	8	1	0	0	0	4	10	3
South Carolina:									
Charleston	71,245	2	1	0	--------	1	0	0	4
Columbia	39,688	5	0	0	--------	1	0	3	1
Greenville	25,789	0	0	0	0	0	0	0	1
Georgia:									
Atlanta	222,963	8	2	5	3	1	0	2	11
Brunswick	15,937	--------	0	0	0	0	0	--------	0
Savannah	89,448	0	0	1	21	1	0	11	3
Florida:									
St. Petersburg	24,403	0	0	0	0	0	0	0	1
Tampa	56,050	3	1	1	--------	1	0	4	2

[1] Population Jan. 1, 1920.

City reports for week ended April 11, 1925—Continued

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST SOUTH CENTRAL									
Kentucky:									
Covington	57,877	0	2	0	4	0	0	0	7
Lexington	43,673	1	0	1	1	1	0	0	2
Louisville	257,671	2	5	2	5	1	1	0	14
Tennessee:									
Memphis	170,067	8	5	0	-------	2	0	1	18
Nashville	121,128	4	1	2	-------	4	4	3	6
Alabama:									
Birmingham	195,901	9	1	2	18	5	1	4	13
Mobile	63,858	0	1	0	-------	1	0	0	2
Montgomery	45,383	0	0	0	0	0	0	14	0
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	30,635	0	1	1	0	-------	0	4	-------
Little Rock	70,916	0	1	3	5	0	5	1	1
Louisiana:									
New Orleans	404,575	4	9	5	6	6	1	0	9
Shreveport	54,590	2	-------	0	1	0	1	0	8
Oklahoma:									
Oklahoma	101,150	1	1	1	4	0	0	1	2
Tulsa	102,018	-------	1	1	0	-------	0	-------	-------
Texas:									
Dallas	177,274	25	3	7	-------	2	4	0	5
Galveston	46,877	0	1	0	0	0	0	0	3
Houston	154,970	2	2	2	0	0	0	0	2
San Antonio	184,727	0	2	5	-------	1	0	0	5
MOUNTAIN									
Montana:									
Billings	16,927	2	1	0	-------	1	0	8	1
Great Falls	27,787	1	1	2	0	0	4	1	1
Helena	[1] 12,037	0	0	0	0	0	0	0	0
Missoula	[1] 12,668	0	0	0	0	0	0	0	1
Idaho:									
Boise	22,806	0	0	0	0	0	0	0	0
Colorado:									
Denver	272,031	16	10	7	-------	7	2	64	18
Pueblo	43,519	2	2	1	-------	1	0	17	4
New Mexico:									
Albuquerque	16,648	1	1	0	0	0	0	2	2
Arizona:									
Phoenix	33,899	0	-------	0	-------	4	0	0	2
Utah:									
Salt Lake City	126,241	10	3	1	0	0	0	30	2
Nevada:									
Reno	12,429	0	0	0	0	0	0	0	1
PACIFIC									
Washington:									
Seattle	[1] 315,685	64	4	4	0	-------	4	67	-------
Spokane	104,573	8	2	3	0	-------	25	0	-------
Tacoma	101,731	13	1	0	-------	1	0	0	0
Oregon:									
Portland	273,621	11	4	14	43	2	3	17	12
California:									
Los Angeles	666,853	45	36	30	6	2	49	18	18
Sacramento	69,950	2	1	2	0	0	0	0	5
San Francisco	539,038	18	24	20	5	0	5	30	6

[1] Population Jan. 1, 1920.

City reports for week ended April 11, 1925—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
NEW ENGLAND											
Maine:											
Portland	2	23	0	0	0	0	0	0	0	6	29
New Hampshire:											
Concord	1	2	0	0	0	1	0	0	0	0	16
Vermont:											
Barre	1	2	0	0	0	0	0	0	0	0	5
Burlington	1	0	0	0	0	0	0	0	0	1	1
Massachusetts:											
Boston	59	95	0	0	0	15	2	1	0	47	263
Fall River	4	1	0	0	0	1	1	0	0	1	31
Springfield	6	28	0	0	0	1	0	0	0	2	27
Worcester	8	10	0	0	0	1	0	0	0	6	58
Rhode Island:											
Pawtucket	1	4	0	1	0	1	0	0	0	0	22
Providence	9	15	0	0	0	3	0	0	0	0	58
Connecticut:											
Bridgeport	6	16	0	0	0	0	0	0	0	0	28
Hartford	5	3	0	0	0	4	0	0	0	9	42
New Haven	8	14	0	0	0	1	1	0	0	8	43
MIDDLE ATLANTIC											
New York:											
Buffalo	19	20	0	1	0	12	0	0	0	28	170
New York	218	372	1	0	0	[1] 102	9	13	1	130	1,494
Rochester	14	57	0	0	0	2	0	0	0	10	87
Syracuse	15	2	0	0	0	2	1	0	0	3	55
New Jersey:											
Camden	3	29	0	4	4	2	0	0	0	5	30
Newark	24	44	0	0	0	9	0	1	0	68	125
Trenton	3	1	0	0	0	2	1	0	0	0	40
Pennsylvania:											
Philadelphia	70	114	0	14	3	40	3	1	0	74	514
Pittsburgh	20	62	1	0	0	16	1	1	0	9	187
Reading	4	9	0	0	0	0	0	1	0	3	27
Scranton	3	3	0	0	0	3	0	0	0	4	-------
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	11	33	2	0	0	7	0	0	0	1	118
Cleveland	25	24	0	0	0	19	1	1	1	40	223
Columbus	6	15	1	6	0	4	0	0	0	11	83
Toledo	15	20	3	0	0	7	0	3	0	21	76
Indiana:											
Fort Wayne	3	7	2	2	0	0	0	0	0	2	18
Indianapolis	12	5	3	6	0	7	0	2	0	15	115
South Bend	3	17	1	0	0	1	0	0	0	2	19
Terre Haute	2	3	1	4	0	3	0	0	0	0	18
Illinois:											
Chicago	81	258	2	0	1	48	2	5	0	111	711
Cicero	1	-------	0	-------	-------	-------	0	-------	-------	-------	-------
Springfield	1	3	1	0	0	2	0	0	0	0	25
Michigan:											
Detroit	74	115	5	0	0	22	2	0	0	68	255
Flint	7	3	1	4	0	0	1	0	0	10	24
Grand Rapids	8	62	1	1	0	1	0	0	0	2	36
Wisconsin:											
Madison	3	0	1	0	0	0	0	0	0	3	7
Milwaukee	31	13	1	7	3	6	1	0	0	23	-------
Racine	4	0	1	0	0	1	0	0	0	0	8
Superior	2	3	3	0	0	0	0	0	0	0	6
WEST NORTH CENTRAL											
Minnesota:											
Duluth	5	0	2	0	0	0	0	0	0	0	27
Minneapolis	28	66	7	2	0	6	1	0	1	1	126
St. Paul	25	26	6	2	0	4	1	0	1	19	90

[1] Pulmonary tuberculosis only.

City reports for week ended April 11, 1925—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL—continued											
Iowa:											
Davenport	2	0	3	3			0	1		0	
Sioux City	2	2	1	0			0	0		0	
Waterloo	2	1	0	5			0	0		2	
Missouri:											
Kansas City	11	92	3	2	0	12	0	0	0	6	125
St. Joseph	2	7	1	0	0	0	0	0	0	0	31
St. Louis	35	103	2	11	0	18	2	1	0	6	246
North Dakota:											
Fargo	1	1	0	0	0	0	0	0	0	1	4
Grand Forks	1	1	1	0			0	0		0	
South Dakota:											
Aberdeen		0		0				0		0	
Sioux Falls	2	2	1	0	0	0	0	0	0	0	8
Nebraska:											
Lincoln	4	3	1	0	0	1	0	0	0	6	19
Omaha	3	1	2	25	0	5	1	0	0	0	65
Kansas:											
Topeka	3	7	1	0	0	1	0	0	0	0	21
Wichita	3	3	4	0	0	1	0	0	0	10	19
SOUTH ATLANTIC											
Delaware:											
Wilmington	3	0	0	0	0	3	1	1	1	0	23
Maryland:											
Baltimore	35	38	1	1	0	23	3	1	0	87	228
Cumberland	0	0	0	0	0	0	0	0	0		17
Frederick	1	0	0	0	0	0	0	0	0	0	3
District of Columbia:											
Washington	19	18	1	6	3	8	2	2	0	20	142
Virginia:											
Lynchburg	0	0	0	0	0	0	0	0	0	7	10
Norfolk	1	1	1	0	0	3	0	0	0	8	
Richmond	2	0	1	0	0	5	0	0	0	0	64
Roanoke	1	0	1	0	0	2	1	0	0	0	15
West Virginia:											
Charleston	1	1	0	2	0	2	1	0	0	0	17
Huntington	1	5	0	3			0	0		0	
Wheeling	2	11	0	0	0	2	0	0	0	1	25
North Carolina:											
Raleigh	0	0	0	5	0	0	0	0	0	4	12
Wilmington	1	0	0	1	0	0	1	0	0	2	5
Winston-Salem	1	0	2	3	0	2	0	0	0	6	18
South Carolina:											
Charleston	0	0	0	0	0	4	0	0	0	0	27
Columbia	0	0	0	0	0	2	0	0	0	6	30
Greenville	0	0	0	1	0	0	0	0	0	0	4
Georgia:											
Atlanta	4	4	4	2	0	5	0	2	1	0	68
Brunswick	0	0	0	0	0	1	0	2	0		5
Savannah	1	0	0	0	0	2	0	0	0	0	28
Florida:											
St. Petersburg	4	0	1	0	0	1	1	0	0	0	8
Tampa	0	2	0	0	0	1	1	2	0	1	28
EAST SOUTH CENTRAL											
Kentucky:											
Covington	1	2	0	0	0	0	0	1	0	0	20
Lexington	1	2	0	1	0	3	0	0	0	0	18
Louisville	4	14	1	5	0	2	1	2	0	8	91
Tennessee:											
Memphis	4	5	2	20	0	11	1	0	0	12	76
Nashville	2	10	1	9	0	5	0	0	0	0	51
Alabama:											
Birmingham	1	16	0	60	1	6	0	0	0	0	82
Mobile	0	1	1	1	0	1	0	0	0	0	24
Montgomery	0	1	0	5	0	0	0	0	0	0	17

City reports for week ended April 11, 1925—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	1	1	0	-------	-------	0	0	-------	0	-------
Little Rock	1	1	0	0	0	2	0	0	0	0	-------
Louisiana:											
New Orleans	3	11	4	1	0	10	2	4	0	10	151
Shreveport	-------	0	-------	1	0	0	-------	0	0	0	28
Oklahoma:											
Oklahoma	3	3	5	0	0	2	1	0	0	0	18
Tulsa	1	2	3	0	-------	-------	1	0	-------	-------	-------
Texas:											
Dallas	2	3	3	0	0	2	0	1	0	2	55
Galveston	1	0	1	1	0	2	0	2	0	0	15
Houston	1	3	1	7	0	6	1	0	0	0	50
San Antonio	0	0	1	1	0	11	1	1	0	0	58
MOUNTAIN											
Montana:											
Billings	1	4	1	1	0	0	0	0	0	1	4
Great Falls	1	7	1	0	0	0	0	0	0	0	4
Helena	0	0	0	0	0	1	0	0	0	0	2
Missoula	1	2	0	0	0	0	0	0	0	0	6
Idaho:											
Boise	0	0	1	0	0	0	0	0	0	0	11
Colorado:											
Denver	11	12	3	0	0	14	0	0	0	5	102
Pueblo	1	0	0	0	0	1	0	2	0	0	12
New Mexico:											
Albuquerque	0	0	0	0	0	3	0	0	0	0	10
Arizona:											
Phoenix	-------	0	-------	0	0	11	-------	0	0	4	36
Utah:											
Salt Lake City	3	2	2	0	0	1	0	0	0	7	30
Nevada:											
Reno	0	0	0	1	0	0	0	0	0	0	2
PACIFIC											
Washington:											
Seattle	8	15	2	20	-------	-------	0	2	-------	84	-------
Spokane	4	3	8	1	-------	-------	0	0	-------	10	-------
Tacoma	2	1	1	0	-------	-------	0	0	-------	0	16
Oregon:											
Portland	6	13	5	2	0	4	0	0	0	6	-------
California:											
Los Angeles	16	26	2	24	2	31	1	0	0	56	250
Sacramento	1	1	0	0	0	1	0	0	0	1	30
San Francisco	17	14	3	6	2	10	2	1	0	37	141

Division, State, and city	Cerebrospinal meningitis: Cases	Cerebrospinal meningitis: Deaths	Lethargic encephalitis: Cases	Lethargic encephalitis: Deaths	Pellagra: Cases	Pellagra: Deaths	Poliomyelitis (infantile paralysis): Cases, estimated expectancy	Poliomyelitis: Cases	Poliomyelitis: Deaths
NEW ENGLAND									
Massachusetts:									
Boston	2	1	0	0	0	0	0	0	0
Rhode Island:									
Providence	0	1	0	0	0	0	0	0	0
MIDDLE ATLANTIC									
New York:									
New York	1	1	4	8	0	0	1	1	0
New Jersey:									
Newark	0	0	1	0	0	0	0	0	0
Trenton	0	1	0	1	0	0	0	0	0

City reports for week ended April 11, 1925—Continued

Division, State, and city	Cerebrospinal meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
MIDDLE ATLANTIC—continued									
Pennsylvania:									
Philadelphia	1	1	1	1	0	0	0	0	0
Pittsburgh	0	0	0	0	0	0	0	1	0
EAST NORTH CENTRAL									
Ohio:									
Toledo	0	0	0	0	0	0	0	1	1
Illinois:									
Chicago	2	0	0	0	0	0	0	0	0
Michigan:									
Detroit	1	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Minneapolis	1	0	0	0	0	0	0	0	0
Missouri:									
St. Louis	0	0	0	0	0	0	0	1	0
Nebraska:									
Omaha	1	0	0	0	0	0	0	0	0
SOUTH ATLANTIC									
North Carolina:									
Winston-Salem	0	0	0	0	0	1	0	0	0
South Carolina:									
Charleston	0	0	0	0	0	1	0	0	0
Columbia	0	0	0	0	0	1	0	0	0
Georgia:									
Atlanta	0	0	0	0	0	1	0	0	0
EAST SOUTH CENTRAL									
Alabama:									
Birmingham	0	0	0	0	0	0	0	1	0
Mobile	0	0	0	0	2	2	0	0	0
Montgomery	0	0	0	0	3	0	0	0	0
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans	0	0	0	0	3	3	0	0	0
Shreveport	0	0	2	1	0	3	0	0	0
Texas:									
Dallas	0	1	0	0	0	1	0	0	0
Galveston	0	0	0	0	0	0	0	2	0
MOUNTAIN									
Colorado:									
Pueblo	0	1	0	0	0	0	0	0	0
PACIFIC									
Oregon:									
Portland	3	4	0	0	0	0	0	0	0
California:									
Los Angeles	1	0	0	0	0	0	0	2	0

The following table gives the rates per hundred thousand population for 105 cities for the 10-week period ended April 11, 1925. The population figures used in computing the rates were estimated as of July 1, 1923, as this is the latest date for which estimates are available. The 105 cities reporting cases had an estimated aggregate population of nearly 29,000,000 and the 97 cities reporting deaths had more than 28,000,000 population. The number of cities included in each group and the aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, February 1 to April 11, 1925—Annual rates per 100,000 population [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14	Mar. 21	Mar. 28	Apr. 4	Apr. 11
Total	[2] 175	[2] 168	149	[3] 169	162	167	167	[4] 168	[5] 178	[6] 158
New England	191	246	241	[3] 189	233	176	147	119	171	166
Middle Atlantic	171	165	163	178	167	214	196	231	241	220
East North Central	145	132	123	119	114	128	134	112	93	[6] 97
West North Central	255	259	209	299	282	201	199	247	220	226
South Atlantic	[2] 153	[2] 183	156	114	104	91	136	95	[7] 83	73
East South Central	63	69	80	51	63	40	69	57	[8] 28	34
West South Central	176	162	125	162	144	158	97	121	83	107
Mountain	191	95	162	153	86	105	143	134	124	105
Pacific	270	180	165	258	235	197	249	[4] 179	374	171
MEASLES CASE RATES										
Total	[2] 254	[2] 297	383	[3] 358	418	449	506	[4] 507	[5] 561	[6] 530
New England	576	661	720	[3] 585	656	542	725	755	957	1,011
Middle Atlantic	205	287	373	343	428	518	598	633	734	680
East North Central	453	515	688	632	789	740	775	798	736	[6] 706
West North Central	17	31	27	73	68	75	93	89	77	58
South Atlantic	[2] 49	[2] 98	110	81	100	146	189	136	[7] 214	207
East South Central	51	74	51	46	86	11	69	34	[8] 21	34
West South Central	37	51	14	51	23	88	42	9	88	51
Mountain	782	153	620	916	29	763	573	38	219	57
Pacific	61	29	64	61	107	110	189	[4] 151	209	241
SCARLET FEVER CASE RATES										
Total	[2] 412	[2] 400	390	[3] 408	395	432	427	[4] 419	[5] 411	[6] 366
New England	614	564	606	[3] 558	584	534	544	604	534	529
Middle Atlantic	373	407	376	412	372	439	417	405	436	359
East North Central	426	397	432	434	433	497	498	483	412	[6] 419
West North Central	871	728	742	734	775	719	792	755	736	647
South Atlantic	[2] 255	[2] 277	167	203	171	219	146	167	[7] 179	152
East South Central	97	212	223	183	194	355	286	286	[8] 288	280
West South Central	162	121	125	144	185	107	134	102	51	88
Mountain	334	382	248	315	286	200	429	248	277	258
Pacific	258	177	186	223	218	229	218	[4] 222	191	174
SMALLPOX CASE RATES										
Total	[2] 76	[2] 79	66	[3] 66	62	61	63	[4] 58	[5] 56	[6] 51
New England	0	0	0	[3] 0	0	0	0	0	12	2
Middle Atlantic	2	4	2	3	1	5	8	7	21	10
East North Central	39	35	56	28	42	39	32	33	24	[6] 22
West North Central	145	193	126	120	114	124	102	135	87	97
South Atlantic	[2] 62	[2] 98	67	43	51	59	57	67	[7] 50	43
East South Central	823	675	532	583	652	446	646	423	[8] 450	572
West South Central	125	139	83	116	74	74	107	107	46	51
Mountain	20	162	86	57	48	95	67	19	19	19
Pacific	267	220	215	313	206	247	212	[4] 191	255	148

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1923.
[2] Wilmington, Del., not included. Report not received at time of going to press.
[3] Hartford, Conn., not included.
[4] Spokane, Wash., not included.
[5] Tampa, Fla., and Memphis, Tenn., not included.
[6] Cicero, Ill., not included.
[7] Tampa, Fla., not included.
[8] Memphis, Tenn., not included.

Summary of weekly reports from cities, February 1 to April 11, 1925—Annual rates per 100,000 population—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14	Mar. 21	Mar. 28	Apr. 4	Apr. 11
Total	[2] 13	[2] 13	11	[3] 14	11	10	12	[4] 11	[5] 8	[6] 10
New England	30	20	0	[3] 13	7	5	30	12	5	2
Middle Atlantic	13	6	10	8	10	5	8	7	4	9
East North Central	8	6	6	7	11	4	7	3	4	[6] 6
West North Central	0	10	4	17	6	10	8	6	2	2
South Atlantic	[2] 17	[2] 34	8	20	8	24	22	12	[7] 23	20
East South Central	11	40	34	34	34	34	46	57	[8] 21	17
West South Central	23	46	42	42	28	28	23	42	32	37
Mountain	29	19	38	76	10	19	0	0	0	19
Pacific	17	12	23	9	15	15	0	[4] 28	20	9

INFLUENZA DEATH RATES

	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14	Mar. 21	Mar. 28	Apr. 4	Apr. 11
Total	[2] 30	[2] 28	30	[3] 34	30	34	42	33	[5] 34	[6] 27
New England	47	27	17	[3] 40	17	35	30	30	35	32
Middle Atlantic	24	22	21	20	15	24	29	22	21	16
East North Central	13	17	18	24	27	33	49	40	38	[6] 27
West North Central	20	11	22	37	35	33	42	46	39	37
South Atlantic	[2] 49	[2] 55	55	49	53	33	53	12	[7] 29	26
East South Central	69	63	74	126	103	91	120	86	[8] 77	74
West South Central	97	122	153	148	143	107	76	36	36	46
Mountain	57	57	57	19	19	48	48	38	181	86
Pacific	41	4	12	29	29	16	12	53	29	12

PNEUMONIA DEATH RATES

	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14	Mar. 21	Mar. 28	Apr. 4	Apr. 11
Total	[2] 225	[2] 222	216	[3] 201	205	222	217	206	[5] 205	[6] 202
New England	211	239	241	[3] 242	226	229	211	219	251	211
Middle Atlantic	253	231	216	185	210	214	217	199	215	190
East North Central	164	168	184	171	195	241	222	214	182	[6] 191
West North Central	134	131	131	166	140	175	173	166	193	228
South Atlantic	[2] 315	[2] 270	252	305	268	246	290	252	[7] 233	238
East South Central	326	320	320	292	269	366	286	269	[8] 253	343
West South Central	352	464	408	260	229	178	178	168	168	168
Mountain	191	277	219	267	162	210	172	200	162	267
Pacific	196	192	213	163	139	155	131	159	159	119

[2] Wilmington, Del., not included. Report not received at time of going to press.
[3] Hartford, Conn., not included.
[4] Spokane, Wash., not included.
[5] Tampa, Fla., and Memphis, Tenn., not included.
[6] Cicero, Ill., not included.
[7] Tampa, Fla., not included.
[8] Memphis, Tenn., not included.

Number of cities included in summary of weekly reports and aggregate population of cities in each group, estimated as of July 1, 1923

Group of cities	Number of cities reporting cases	Number of cities reporting deaths	Aggregate population of cities reporting cases	Aggregate population of cities reporting deaths
Total	105	97	28,898,350	28,140,934
New England	12	12	2,098,746	2,098,746
Middle Atlantic	10	10	10,304,114	10,304,114
East North Central	17	17	7,032,535	7,032,535
West North Central	14	11	2,515,330	2,381,454
South Atlantic	22	22	2,566,901	2,566,901
East South Central	7	7	911,885	911,885
West South Central	8	6	1,124,564	1,023,013
Mountain	9	9	546,445	546,445
Pacific	6	3	1,797,830	1,275,841

FOREIGN AND INSULAR

THE FAR EAST

Wireless health news messages.—The following messages were sent by wireless from the Far Eastern Bureau of the Health Section of the League of Nations to headquarters at Geneva, Switzerland:

"Week ended March 28—Batavia, nil. Hongkong, smallpox 5, 2 deaths. Manila, nil. Samarang, plague 2 and 2 deaths. Singapore, plague 3 and 3 deaths. Soerabaya, nil."

"During the week ended April 4, there has been no case of plague, cholera, smallpox, or other important epidemic in Batavia, Soerabaya, Belawan Deli, Macassar, Samarang, or Penang. Two plague-infected rats were found during the week in Soerabaya. Four cases of smallpox with two deaths are reported in Hongkong and 3 cases with no deaths in Manila. One case of plague and 1 fatal case of smallpox are reported in Singapore, where one plague-infected rat was found during the week."

CANARY ISLANDS

Plague—Las Palmas.—Under date of March 26, 1925, a fatal case of plague was reported at Las Palmas, Canary Islands.

DUTCH GUIANA

Smallpox—Paramaribo.—A case of smallpox was reported at Paramaribo, Dutch Guiana, April 20, 1925.

ECUADOR

Mortality—Communicable diseases—Quito—February, 1925.—During the month of February, 1925, 137 deaths from all causes were reported at Quito, Ecuador, including diphtheria, 1 death; dysentery, 5 deaths; measles, 3; typhoid fever, 5; tuberculosis, 4. Four deaths from organic diseases of the heart were reported. Population, 100,651.

ESTHONIA

Typhoid fever and paratyphoid—February, 1925.—During the month of February, 1925, 110 cases of typhoid fever, with seven cases of paratyphoid fever, were reported in the Republic of Esthonia. Population, 1,107,059.

FINLAND

Communicable diseases—March 1-15, 1925.—During the period March 1 to 15, 1925, communicable diseases were reported in Finland as follows: Diphtheria, 51; dysentery, 5; lethargic encephalitis, 2; scarlet fever, 113; typhoid fever, 22; paratyphoid fever, 13.

INDO-CHINA

Cholera, plague, smallpox—December, 1924.—During the month of December, 1924, cholera, plague, and smallpox were reported in Indo-China as follows: Cholera—cases, 5; deaths, 2; month of December, 1923—cases, 15; deaths, 9. Plague—11 cases, 11 deaths; December, 1923, cases, 15; deaths, 5. Smallpox—cases, 485; deaths, 114; December, 1923, 3 cases with 1 death, European; 344 cases, 102 deaths, native. For distribution of occurrence according to locality, see pages 917 and 918.

Influenza.—During the period under report, 38 cases of influenza with two deaths were reported in Indo-China.

JAVA

Lethargic encephalitis—Malaria—Soerabaya.—Under date of February 26, 1925, a case of lethargic encephalitis was reported at Soerabaya, occuring in a member of the foreign resident population. Epidemic malaria was reported in two native sections of Soerabaya district, 3,000 cases having been reported in a population of 7,000.

LATVIA

Communicable diseases—January, 1925.—Communicable diseases were reported in the Republic of Latvia, during the month of January, 1925, as follows:

Disease	Cases	Disease	Cases
Chicken pox	1	Mumps	95
Diphtheria	85	Scarlet fever	313
Dysentery	5	Smallpox	5
Influenza	7	Typhoid fever	98
Leprosy	1	Typhus fever	33
Measles	252	Whooping cough	68

MALTA

Communicable diseases—March 1-15, 1925.—During the period March 1 to 15, 1925, communicable diseases were notified in the Island of Malta as follows: Chicken pox, 5 cases; influenza, 168 (including 1 case of pneumonia and 9 cases of broncho-pneumonia); 4 cases of lethargic encephalitis; 13 cases of Malta (undulant) fever; 1 case of poliomyelitis (infantile paralysis); and 1 case of typhoid fever.

VIRGIN ISLANDS

Communicable diseases—March, 1925.—During the month of March, 1925, communicable diseases were reported in the Virgin Islands of the United States as follows:

Island and disease	Cases	Remarks
St. Thomas and St. John:		
Chancroid	1	Imported.
Chicken pox	1	Do.
Dengue	1	
Gonorrhea	5	Imported, 1; St. John, 1.
Malaria	6	Imported, 1; malignant tertian, 1; benign tertian, 5
Pellagra	1	
Syphilis	8	Imported, 2; primary, 1; secondary, 6.
Trachoma	2	
Tuberculosis	6	Chronic pulmonary.
St. Croix:		
Chicken pox	4	
Gonorrhea	5	
Filariasis	4	Bancrofti.
Leprosy	4	
Malaria	1	Estivo-autumnal.

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

The reports contained in the following tables must not be considered as complete or final as regards either the lists of countries included or the figures for the particular countries for which reports are given.

Reports Received During Week Ended May 1, 1925 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
Ceylon				Dec. 28, 1924-Jan. 24, 1925: Cases, 24; deaths, 17.
India				Feb. 15-21, 1925: Cases, 1,776; deaths, 991.
Indo-China				Dec. 1-31, 1924: Cases, 5; deaths, 2. Corresponding period 1923: Cases, 15; deaths, 9.
Cambodia	Dec. 1-31	1		
Cochin-China	do	3	1	
Tonkin	do	1	1	

PLAGUE

Place	Date	Cases	Deaths	Remarks
Brazil:				
Bahia	Mar. 8-14	1	1	
Canary Islands:				
Las Palmas	Mar. 26	1	1	
Gold Coast	December, 1924	4	4	
India				Feb. 15-21, 1925: Cases, 4,403; deaths, 3,579.

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received During Week Ended May 1, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Indo-China				Dec. 1-31, 1924: Cases, 11; deaths, 11. Corresponding month 1923: Cases, 15; deaths, 5.
Province—				
Anam	Dec. 1-31	5	5	
Cambodia	do	6	6	
Iraq				Dec. 13, 1924-Jan. 3, 1925: Cases, 2; deaths, 1.
Java:				
Samarang	Mar. 22-28	2	2	
Soerabaya	Feb. 12-18	1	1	Mar. 29-Apr. 4, 1925: Two plague rats found.
Straits Settlements:				
Singapore	Mar. 1-7	2		Mar. 28-Apr. 4, 1925: Cases, 4; deaths, 1. One plague rat.
Union of South Africa				Mar. 1-7, 1925: Cases, 2; deaths, 1.
Orange Free State—				
Boshof District	Mar. 1-7	1		White.
Kroonstad District	do	1	1	Native.

SMALLPOX

Place	Date	Cases	Deaths	Remarks
Arabia:				
Aden	Mar. 8-14	1		Imported.
Belgium	Jan. 1-Feb. 10	4		
British East Africa:				
Mombasa	Jan. 25-Feb. 28	65	14	
Tanganyika Territory	Feb. 15-21	1		
British South Africa:				
Southern Rhodesia	Mar. 5-11	1	1	Case European; death, native.
Canada:				
British Columbia—				
Vancouver	Mar. 30-Apr. 5	14		
Victoria	Apr. 8-14	1		
Manitoba—				
Winnipeg	Apr. 5-11	1		
Ontario—				
Ottawa	Mar. 29-Apr. 4	1		
China:				
Hongkong	Mar. 22-Apr. 4	9	4	
Dutch Guiana:				
Paramaribo	Apr. 20	1		
France	Jan., 1925	10		
Gold Coast	Oct.-Dec., 1924	24		
India				Feb. 15-21, 1925: Cases, 4,045; deaths, 909.
Karachi	Mar. 15-21	6	1	
Madras	do	97	40	
Indo-China				Dec. 1-31, 1924: Cases, 485; deaths 114. Corresponding period, 1923: Cases, 344; deaths, 102, native; (European cases, 3; deaths, 1.)
Anam	Dec. 1-31	167	26	
Cambodia	do	30	13	
Cochin-China	do	50	13	
Saigon	Feb. 1-7	5	1	Including 100 square kilometers of surrounding country.
Tonkin	Dec. 1-31	238	62	
Iraq	Dec. 14-Jan. 10	1	1	
Do	Jan. 11-20	4	2	
Mexico:				
Mexico City	Mar. 22-28	4		Including municipalities in Federal District.
Saltillo	Apr. 5-11		1	
San Luis Potosi	do		1	
Vera Cruz	Mar. 30-Apr. 5		1	
Yucatan State	Apr. 5-11			In country towns.
Philippine Islands:				
Manila	Mar. 29-Apr. 4	3		
Russia	Jan.-June, 1924	18,229		
Do	July-Nov., 1925	3,665		
Senegal:				
Dakar	Mar. 16-22	4		
Spain:				
Barcelona	Mar. 19-25		1	
Cadiz	Feb. 1-28		1	
Malaga	Mar. 22-Apr. 4		7	
Valencia	Mar. 22-28	1		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received During Week Ended May 1, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Straits Settlements:				
Singapore	Mar. 28–Apr. 4	1	1	
Tripoli	Dec. 13–Jan. 2	1		
Tunis:				
Tunis	Mar. 26–Apr. 8	27	43	
Union of South Africa:				
Natal	Mar. 1–7			Outbreaks.
Uruguay	November, 1924	8	1	

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Czechoslovakia	January, 1925	14		
Egypt:				
Alexandria	Mar. 12–18	1		
Mexico:				
Mexico City	Mar. 22–28	9		
Rumania	September–December.	199	26	
Russia	January–June, 1924	95,682		
Do	July–November, 1924.	34,729		
Tunis:				
Tunis	Apr. 2–8	3		
Union of South Africa:				
Cape Province	Mar. 1–7			Outbreaks.
Natal	do			Do.

Reports Received from December 27, 1924, to April 24, 1925 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
Ceylon				June 29–Dec. 27, 1924: Cases, 14; deaths, 13.
Colombo	Nov. 16–22	1		
Do	Jan. 11–24	2	2	
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 27,164; deaths, 16,228. Jan. 4–Feb. 14, 1925: Cases, 14,118; deaths, 8,390.
Bombay	Nov. 23–Dec. 20	4	4	
Do	Jan. 18–24	1	1	
Calcutta	Oct. 26–Jan. 3	59	51	
Do	Jan. 4–Mar. 7	162	134	
Madras	Nov. 16–Jan. 3	69	40	
Do	Jan. 4–Mar. 7	137	98	
Rangoon	Nov. 9–Dec. 20	9	2	
Do	Jan. 4–Feb. 28	11	8	
Indo-China				Aug. 1–Sept. 30, 1924: Cases, 14; deaths, 10.
Province—				
Anam	Aug. 1–31	1	1	
Cambodia	Aug. 1–Sept. 30	6	5	
Cochin-China	do	7	4	
Saigon	Nov. 30–Dec. 6	1		
Siam:				
Bangkok	Nov. 9–29	4	2	
Do	Jan. 18–Feb. 21	6	3	

PLAGUE

Place	Date	Cases	Deaths	Remarks
Azores:				
Fayal Island—				
Castelo Branco	Nov. 25			Present with several cases.
Feteira	do	1		
St. Michael Island	Nov. 2–Jan. 3	30	13	
Do	Jan. 18–24	3	1	
Brazil:				
Bahia	Jan. 4–Feb. 28	4	3	

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
British East Africa:				
Tanganyika Territory	Nov. 23–Dec. 27	17	10	
Do	Jan. 18–24	17	11	
Uganda	Aug.–Dec., 1924	279	243	
Canary Islands:				
Las Palmas	Jan. 21–23	2		Stated to be endemic.
Do	Feb. 4	1		Stated to have been infected with plague Sept. 30, 1924.
Realejo Alto	Dec. 19	3	1	Vicinity of Santa Cruz de Teneriffe.
Teneriffe—				
Santa Cruz	Jan. 3	1		In vicinity.
Celebes:				
Macassar	Oct. 29			Epidemic.
Ceylon:				
Colombo	Nov. 9–Jan. 3	12	9	
Do	Jan. 4–Mar. 7	9	12	5 plague rodents.
China:				
Foochow	Dec. 28–Jan. 3			Present.
Nanking	Nov. 23–Mar. 7			Do.
Shing Hsien	October, 1924		790	
Ecuador:				
Chimborazo Province—				
Alausi District	Jan. 14		14	At 2 localities on Guayaquil & Quito Railway.
Guayaquil	Nov. 16–Dec. 31	9	3	Rats taken, 27,004; found infected, 92.
Do	Jan. 1–Mar. 15	59	25	Rats taken, 45,027; rats found infected, 234.
Naranjito	Feb. 16–Mar. 15	1		
Yaguachi	Feb. 1–Mar. 15	2	1	
Egypt				Year 1924: Cases, 373. Jan. 1–28, 1925: Cases, 15.
City—				
Alexandria	Year 1924	2	2	Last case, Nov. 26.
Ismailia	do	1	1	Last case, July 6.
Port Said	do	6	4	Last case, Dec. 7.
Suez	do	20	13	Last case, Dec. 20.
Province—				
Dakhalia	Jan. 1–8	1	1	
Kalioubiah	do	3		
Menoufieh	do	7	3	
Gold Coast				September-November, 1924: Deaths, 48.
Hawaii:				
Honokaa	Nov. 4	1		Plague-infected rodents found, Dec. 9, 1924, and Jan. 15, 1925.
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 28,154; deaths, 21,505. Jan. 4–Feb. 14, 1925: Cases, 24,477; deaths, 20,443.
Bombay	Nov. 22–Jan. 3	4	3	
Do	Jan. 4–17	2	2	
Do	Feb. 8–28	6	6	
Calcutta	Jan. 18–24	1	1	
Karachi	Nov. 30–Dec. 6	2	1	
Do	Jan. 4–Feb. 21	12	11	
Madras Presidency	Nov. 23–Jan. 3	685	487	
Do	Jan. 4–24	658	511	
Rangoon	Oct. 26–Jan. 3	26	25	
Do	Jan. 4–Feb. 28	79	69	
Indo-China				Aug. 1–Sept. 30, 1924: Cases, 25; deaths, 20.
Province—				
Anam	Aug. 1–Sept. 30	4	4	
Cambodia	do	18	15	
Cochin-China	do	3	1	
Saigon	Dec. 25–31	1	1	Including 100 square kilometers of surrounding territory.
Do	Jan. 11–17	2	1	Do.
Iraq	June 29–Dec. 13	18	13	
Japan	Aug. 10–Dec. 6	19		
Java:				
East Java—				
Blitar	Nov. 11–22			Province of Kediri; epidemic.
Pare	Nov. 29			Do.
Sidoardja	Jan. 2			Declared epidemic, Province of Soerabaya.
Soerabaya	Nov. 16–Dec. 31	71	72	
Do	Jan. 15–Feb. 7	4	3	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Java—Continued.				
West Java—				
Cheribon	Oct. 14-Nov. 3		14	
Do	Nov. 18-Dec. 22		80	
Do	Jan. 1-14		44	Cheribon Province.
Do	Jan. 30			Present.
Pasoeroean	Dec. 27			Province. Epidemic in one locality.
Pekalongan	Oct. 14-Nov. 3		29	
Do	Nov. 18-Dec. 31		177	Pekalongan Province.
Do	Jan. 1-14		81	
Probalingga	Dec. 27			Province. Epidemic.
Tegal	Oct. 14-Dec. 31		26	
Do	Jan. 1-14		37	Pekalongan Province.
Madagascar:				
Fort Dauphin (port)	Nov. 1-Dec. 15	12	5	
Do	Feb. 1-15	1	1	Bubonic.
Itasy Province				Nov. 1-Dec. 15, 1924: Cases, 4; deaths, 2.
Do	Feb. 1-15	1	1	Bubonic.
Majunga (port)	Nov. 1-30	1	1	
Moramanga Province				Nov. 1-Dec. 15, 1924: Cases, 49; deaths, 34. Jan. 16-Feb. 15, 1925: Cases, 5; deaths, 5.
Tamatave (port)	Nov. 1-30	1	1	
Tananarive Province				Oct. 16-Dec. 31, 1924: Cases, 298; deaths, 274.
Do				Jan. 1-Feb. 15: Cases, 227; deaths, 194.
Tananarive (town)	Oct. 16-Nov. 30	8	7	Bubonic, pneumonic, septicemic.
Do	Dec. 16-31	4	4	
Do	Jan. 1-Feb. 15	3	3	Septicemic.
Mauritius Island				Year 1924: Cases, 161; deaths, 144.
District—				
Flacq	Dec. 1-31	5	4	
Pamplemousses	do	1	1	
Plaines Wilhems	January-December, 1924.	54	47	Not present March, April, May.
Port Louis	February-December, 1924.	101	92	
Mexico:				
Tampico	Apr. 6, 1925			Plague rat found in vicinity of Government wharves.
Morocco:				
Marrakech				Feb. 9, 1925: Present in native quarter of town. Stated to be pneumonic in form and of high mortality.
Nigeria				August-November, 1924: Cases, 387; deaths, 317.
Palestine:				
Jerusalem	Mar. 3-9	1		
Peru:				
Callao	February, 1925	6	6	
Siam:				
Bangkok	Dec. 28-Jan. 3	1	1	
Do	Jan. 25-Feb. 14	2	1	
Siberia:				
Transbaikalia—				
Turga	October, 1924		3	On Chita Railroad.
Straits Settlements:				
Singapore	Nov. 9-15	1	1	
Do	Jan. 4-Feb. 28	13	10	
Syria:				
Beirut	Jan. 11-20	1		
Turkey:				
Constantinople	Jan. 9-15	5	5	
Union of South Africa	Nov. 22-Jan. 3	28	15	In Cape Province, Orange Free State, and Transvaal.
Do	Jan. 4-Feb. 28	43	17	Do.
On vessel:				
S. S. Conde				At Marseille, France, Nov. 8, 1924. Plague rat found. Vessel left for Tamatave, Madagascar, Nov. 12, 1924.
Steamship	November, 1924	1	1	At Majunga, Madagascar, from Djibuti, Red Sea port.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

SMALLPOX

Place	Date	Cases	Deaths	Remarks
Algeria				July 1-Dec. 31, 1924: Cases, 409. Jan. 1-20, 1925: Cases, 107.
Algiers	Jan. 1-Feb. 28	6		
Arabia:				
Aden	Jan. 25-Mar. 21	11	1	
Bolivia:				
La Paz	Nov. 1-Dec. 31	20	11	
Do	Jan. 1-Feb. 28	5	7	
Brazil:				
Pernambuco	Nov. 9-Jan. 3	100	27	
Do	Jan. 4-Feb. 28	95	42	
British East Africa:				
Kenya—				
Mombasa	Jan. 18-24	1		
Unganda—				
Entebbe	Oct. 1-31	4		
British South Africa:				
Northern Rhodesia	Oct. 28-Dec. 15	57	2	
Do	Jan. 27-Feb. 2	3		Natives.
Southern Rhodesia	Jan 29-Feb. 4	1		
Bulgaria:				
Sofia	Mar. 12-18	1		Varioloid.
Canada:				
Alberta—				
Calgary	Mar. 15-21	1		
British Columbia—				
Ocean Falls	Mar. 7-27	6		Very mild.
Vancouver	Dec. 14-Jan. 3	32		
Do	Jan. 4-Mar. 30	288		
Victoria	Jan. 18-Apr. 4	6		
Manitoba—				
Winnipeg	Dec. 7-Jan. 3	14		
Do	Jan. 4-Feb. 27	30		
New Brunswick—				
Bonaventure and Gaspe Counties.	Jan. 1-31	1		
Northumberland	Feb. 8-14	1		County.
Ontario				Nov. 30-Dec. 27, 1924: Cases, 33. Dec. 28, 1924, to Mar. 28, 1925: Cases, 57; deaths, 1.
Hamilton	Jan. 24-30	1		
Ceylon				July 27-Nov. 29, 1924: Cases, 27; deaths, 1.
Colombo	Jan. 18-Feb. 7	4		
China:				
Amoy	Nov. 9-Feb. 14			Present. Feb. 22-Mar. 7, 1925: Deaths, 4.
Antung	Nov. 17-Dec. 28	5		
Do	Jan. 5-Feb. 14	15	1	
Do	Mar. 2-8	3		
Foochow	Nov. 2-Feb. 28			Present.
Hongkong	Nov. 9-Jan. 3	6	2	
Do	Jan. 4-Feb. 7	9	7	
Do	Feb. 15-Mar. 7	5	5	
Manchuria—				
Dairen	Jan. 19-Feb. 1	2		
Harbin	Jan. 15-Feb. 11	5		
Nanking	Jan. 4-Mar. 7			Do.
Shanghai	Dec. 7-27	1	2	
Do	Jan. 18-Mar. 7		8	
Chosen:				
Seoul	Dec. 1-31	1		
Colombia:				
Buenaventura	Feb. 15-28	2		
Santa Marta	Mar. 15-28			Present in mild form in localities in vicinity.
Czechoslovakia				April-June, 1924: Cases, 1; occurring in Province of Moravia.
Dominican Republic:				
Puerta Plata	Mar. 8-21	3		
Ecuador:				
Guayaquil	Nov. 16-Dec. 15	4		
Egypt:				
Alexandria	Nov. 12-Dec. 31	10		
Do	Jan. 8-28	8		
Do	Feb. 26-Mar. 4	1		
Esthonia				Dec. 1-31, 1924: Cases, 2.
France				July-December, 1924: Cases, 81.
Dunkirk	Mar. 2-8	1		From vessel. In quarantine.
St. Malo	Feb. 2-8	7	1	Believed to have been imported on steamship Ruyth from Sfax, Tunis.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Germany				June 29-Nov. 8, 1924: Cases, 7.
Frankfort-on-Main	Jan. 1-10	1		
Gibraltar	Dec. 8-14	1		
Gold Coast				July-September, 1924: Cases, 82; deaths, 1.
Great Britain:				
England and Wales	Nov. 23-Jan. 3	472		
Do	Jan. 4-Mar. 21	1,477		
Newcastle-on-Tyne	Jan. 18-Feb. 21	9		
Do	Mar. 1-7	1		
Greece				January-June, 1924: Cases, 170; deaths, 27.
Do				July-December, 1924: Cases, 38; deaths, 26.
Saloniki	Nov. 11-Dec. 22	3		
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 12,564; deaths, 2,857. Jan. 4-Feb. 14, 1925: Cases, 18,789; deaths, 4,110.
Bombay	Nov. 2-Jan. 3	30	18	
Do	Jan. 4-Feb. 28	265	135	
Calcutta	Oct. 26-Jan. 8	307	170	
Do	Jan. 4-Mar. 7	1,627	1,101	
Karachi	Nov. 16-Jan. 3	16	2	
Do	Jan. 4-Feb. 14	52	6	
Do	Feb. 22-Mar. 14	40	11	
Madras	Nov. 16-Jan. 3	122	48	
Do	Jan. 4-Mar. 7	552	212	
Rangoon	Oct. 26-Jan. 3	86	28	
Do	Jan. 4-Feb. 28	504	98	
Indo-China				Aug. 1-Sept. 30, 1924: Cases, 223; deaths, 76.
Province—				
Anam	Aug. 1-Sept. 30	49	11	
Cambodia	do	40	9	
Cochin-China	do	115	49	
Saigon	Nov. 16-Jan. 3	17	5	Including 100 sq. km. of surrounding country.
Do	Jan. 4-10	3	1	
Do	Jan. 25-31	5	2	Do.
Do	Feb. 8-21	19	4	Do.
Tonkin	Aug. 1-Sept. 30	19	7	
Iraq	June 29-Dec. 13	137	66	
Bagdad	Nov. 9-Dec. 27	2	1	
Do	Mar. 1-7	1		
Italy				June 29-Dec. 27, 1924: Cases, 63;
Jamaica				Nov. 30, 1924-Jan. 3, 1925: Cases, 50. Reported as alastrim.
Do				Jan. 4-31, 1925: Cases, 43. Reported as alastrim.
Kingston	Nov. 30-Dec. 27	4		Reported as alastrim.
Japan				Aug. 1-Nov. 15, 1924: Cases, 4.
Nagasaki	Feb. 9-Mar. 22	7	2	
Taiwan	Jan. 1-31	1		
Java:				
East Java—				
Pasoeroean	Oct. 26-Nov. 1	9	1	
Do	Nov. 12-19			Epidemic in 2 native villages.
Soerabaya	Oct. 19-Dec. 31	685	212	
Do	Jan. 15-Feb. 7	258	31	
West Java—				
Batam	Oct. 14-20	2		
Batavia	Oct. 21-Nov. 14	2		
Do	Dec. 20-Jan. 2	19	4	
Buitenzorg	Dec. 25-31	1		Batavia Residency.
Cheribon	Oct. 14-Nov. 24	15		
Do	Jan. 1-28	3		
Krawang	Jan. 15-21	1		
Pekalongan	Oct. 14-Nov. 24	22		
Do	Dec. 25-31	3		Province.
Pemalang	Jan. 8-14	1		Pekalongan Residency.
Preanger	Nov. 18-24	1		
Latvia				Oct. 1-Nov. 30, 1924: Cases, 5. Jan. 1-31, 1925: Cases, 5.
Lithuania				Jan. 1-31, 1925: Cases, 2.
Mexico:				
Durango	Dec. 1-31		5	
Do	Jan. 1-Mar. 31		16	
Guadalajara	Dec. 23-29		1	
Do	Jan. 6-Mar. 23		4	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Mexico—Continued.				
Mexico City	Nov. 23-Dec. 27	5		
Do	Jan. 11-Mar. 21	31		
Monterey				Jan. 24, 1925: Outbreak, Mar. 14, 1925, present.
Salina Cruz	Dec. 1-31	1	1	
Do	Feb. 22-28	2		
Saltillo	do		1	
San Luis Potosi	Mar. 29-Apr. 4		1	
Tampico	Dec. 11-31	5	4	
Do	Jan. 1-Mar. 31	59	18	
Vera Cruz	Dec. 1-Jan. 3		10	
Do	Jan. 5-Mar. 29		37	
Villa Hermosa	Dec. 28-Jan. 10			Present. Locality, capital, State of Tabasco.
Nigeria				January-June, 1924: Cases, 357; deaths, 87.
Do				July-November, 1924: Cases, 87; deaths, 25.
Persia:				
Teheran				Sept. 23-Dec. 31, 1924: Deaths, 12.
Do	Jan. 1-31		10	
Peru:				
Arequipa	Nov. 24-30		1	
Do	Jan. 1-31		3	
Poland				Sept. 21-Dec. 28, 1924: Cases, 30; deaths, 2.
Portugal:				
Lisbon	Dec. 7-Jan. 3	17		
Do	Jan. 4-Mar. 14	78	7	
Oporto	Nov. 30-Dec. 27	3	2	
Do	Jan. 11-Mar. 14	3		
Russia				January-June, 1924: Cases, 9,683. July-September, 1924: Cases, 1,251.
Siam:				
Bangkok	Dec. 28-Jan. 3	1	1	
Do	Jan. 18-Feb. 21		19	
Sierra Leone:				
Freetown	Feb. 7-14	2		From S. S. Elmina.
Spain:				
Barcelona	Nov. 27-Dec. 31		5	
Cadiz	Nov. 1-Dec. 31		51	
Do	Jan. 1-31		9	
Madrid	Year 1924		40	
Do	Jan.-Feb.		13	
Malaga	Nov. 23-Jan. 3		97	
Do	Jan. 4-Mar. 21		83	
Valencia	Nov. 30-Dec. 6	2		
Do	Feb. 15-Mar. 21	4		
Straits Settlements:				
Singapore	Feb. 22-28	2		
Switzerland:				
Lucerne	Nov. 1-Dec. 31	19		
Do	Jan. 1-31	24		
Syria:				
Aleppo	Nov. 23-Dec. 27	13		
Do	Jan. 4-Feb. 28	71	18	
Beirut	Feb. 11-20	1		
Damascus	Jan. 6-13	2		
Do	Feb. 11-20	22		
Tripoli:				
Tripoli	July 14-Dec. 12	52		
Tunis:				
Tunis	Nov. 25-Dec. 29	42	35	
Do	Jan. 1-Mar. 25		248	
Turkey:				
Constantinople	Dec. 13-19	5		
Union of South Africa				Nov. 1-Dec. 31, 1924: Cases, 14.
Cape Province	Feb. 1-7			Outbreaks. Jan. 1 - 31, 1925: Cases, 4. Natives.
De Aar District	Jan. 25-31			Outbreak at railway camp.
Do	Nov. 9-Jan. 17			Outbreaks.
Orange Free State	Nov. 2-8			Do.
Ladybrand District	Jan. 15-31			Outbreak, on farm.
Transvaal	Nov. 9-Jan. 10			Do.
Do	Feb. 1-7			Outbreaks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Uruguay				January-June, 1924: Cases, 101; deaths, 2.
Do				July-October, 1924: Cases, 45; deaths, 4.
On vessel:				
S. S. Eldridge	Mar. 23	1		At Port Townsend, from Yokohama and ports.
S. S. Habana	Feb. 18	1		At Santiago de Cuba, from Kingston, Jamaica.
S. S. Ruyth				At St. Malo, France, January, 1924, from Sfax, Tunis; believed to have imported smallpox infection.

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Algeria				July 1-Dec. 20, 1924: Cases, 101; deaths, 14.
Algiers	Nov. 1-Dec. 31	5	1	
Do	Jan. 1-Mar. 10	10	4	
Argentina:				
Rosario	Jan. 1-31		1	
Bolivia:				
La Paz	Nov. 1-Dec. 31	3		
Do	Jan. 1-31	2		
Bulgaria				January-June, 1924: Cases, 191; deaths, 28.
Do				July-October, 1924: Cases, 5.
Chile:				
Concepcion	Nov. 25-Dec. 1		1	
Do	Jan. 6-12		2	
Do	Jan. 27-Feb. 2		1	
Iquique	Nov. 25-Dec. 1		2	
Do	Feb. 1-7		1	
Talcahuano	Nov. 16-Dec. 20		5	
Do	Jan. 4-10		1	
Valparaiso	Nov. 25-Dec. 7		4	
Do	Jan. 11-Mar. 7		11	
Chosen:				
Chemulpo	Feb. 1-28	1		
Seoul	Nov. 1-30	1	1	
Do	Feb. 1-28	2	1	
Czechoslovakia				December, 1924: Cases, 5.
Egypt:				
Alexandria	Dec. 3-9	1	1	
Cairo	Oct. 1-Dec. 23	13	8	
Esthonia				Dec. 1-31, 1924: Cases, 5.
Do	Jan. 1-31	4		
France				July-October, 1924: Cases, 7.
Gold Coast				Oct. 1-31, 1924: 1 case.
Greece				May-June, 1924: Cases, 116; deaths, 8.
Do				July-December, 1924: Cases, 40; deaths, 4.
Saloniki	Nov. 17-Dec. 15	3	2	
Do	Jan. 25-31	1		
Japan				Aug. 1-Nov. 15, 1924: Cases, 2.
Latvia				October-December, 1924: Cases, 30.
Lithuania				August-October, 1924: Cases, 15; deaths, 1.
Do				Jan. 1-31, 1925: Cases, 27; deaths, 2.
Mexico:				
Durango	Dec. 1-31		1	
Do	Mar. 15-31	1	1	
Guadalajara	Dec. 23-29		1	
Mexico City	Nov. 9-Jan. 3	80		Including municipalities in Federal District.
Do	Jan. 11-Mar. 21	24		
San Luis Potosi	Mar. 8-14		1	
Morocco				November, 1924; Cases, 5.
Palestine				Nov. 12-Dec. 8, 1924: Cases, 7.
Ekron	Dec. 23-29	1		
Jerusalem	do	2		
Do	Jan. 20-26	1		
Mikveh Isreal	do	1		
Ramleh	Feb. 10-16	1		
Tiberias	Feb. 24-Mar. 2	2		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to April 24, 1925—Continued

TYPHUS FEVER—Continued

Place	Date	Cases	Deaths	Remarks
Peru:				
Arequipa	Nov. 24-Dec. 31		3	
Poland				Sept. 28, 1924-Jan. 3, 1925: Cases, 751; deaths, 57.
Portugal:				
Lisbon	Dec. 29-Jan. 4		2	
Oporto	Jan. 4-Feb. 7	2		
Rumania				January-June, 1924: Cases, 2,906; deaths, 328.
Do				July-August, 1924: Cases, 89; deaths, 12.
Constanza	Dec. 1-20	1		
Do	Feb. 1-28	2		
Russia				Jan. 1-June 30, 1924: Cases, 92,000. July-September, 1924: Cases, 5,225.
Leningrad	June 29-Nov. 22	12		
Spain:				
Madrid	Year 1924		3	
Malaga	Dec. 21-27		1	
Sweden:				
Goteborg	Jan. 18-Feb. 28	2		
Tunis				July 1-Dec. 20, 1924: Cases, 40.
Tunis	Mar. 5-25	9	1	
Turkey:				
Constantinople	Nov. 15-Dec. 19	6	1	
Do	Jan. 2-Mar. 7	9	1	
Union of South Africa				Nov. 1-Dec. 31, 1924: Cases, 345; deaths, 87. Jan. 1-31, 1925: Cases, 94; deaths, 12; native. In white population, cases, 2.
Cape Province	Nov. 1-Dec. 31	126	24	Jan. 1-31, 1925: Native, cases, 41; deaths, 6.
Do	Feb. 1-28			Outbreaks.
East London	Nov. 16-22	1		
Do	Jan. 18-24	1		
Port Elizabeth	Feb. 22-28	1		
Natal	Nov. 1-Dec. 31	130	50	
Do				Jan. 1-31, 1925: Cases, 28; deaths, 4. Native.
Durban	Feb. 15-21	1		
Orange Free State	Nov. 1-Dec. 31	59	8	Jan. 11-31, 1925: Cases, 16, deaths, 2. Native.
Do	Feb. 15-21			Outbreaks.
Transvaal	Nov. 1-Dec. 31	30	5	
Do				Jan. 1-31, 1925: Cases, 9. Native.
Yugoslavia				Aug. 3-Oct. 18, 1924: Cases, 17; deaths, 2. Mar. 8-14, 1925: Cases, 1.
Belgrade	Nov. 24-Dec. 28	5		

YELLOW FEVER

Place	Date	Cases	Deaths	Remarks
Gold Coast	October-November, 1924.	4	4	
Salvador:				
San Salvador	June-October, 1924	77	28	Last case, Oct. 22, 1924.