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PREVALENCE OF SMALLPOX IN THE UNITED STATES

The health officers of 37 States reported 28,000 cases of smallpox during 52 weeks ended December 31, 1927. This number is practically the same as the number reported by the same States for 52 weeks in 1925, but it is 2,300 cases more than were reported for the same period in 1926.

The figures are shown in the following table, preliminary weekly telegraphic reports being used for each year:

Preliminary reports from 37 States for 52 weeks

	Cases
1925	28,070
1926	25,708
1927	28,008

The population of these States was about 83,900,000 in 1925, and 87,600,000 in 1927.

During the last four months of the year 1927 the usual seasonal rise in incidence of smallpox occurred, but there were more cases than were reported in either 1925 or 1926. The following table gives a comparison of the preliminary telegraphic reports from 37 States for the last 20 weeks of the years 1925, 1926, and 1927.

Smallpox cases reported by 37 States for 20 weeks

Four weeks ended—	1927	Corresponding week	
		1926	1925
Sept. 10, 1927	493	448	382
Oct. 8, 1927	631	398	380
Nov. 5, 1927	982	761	712
Dec. 3, 1927	1,920	1,772	1,463
Dec. 31, 1927	2,598	2,475	1,646
Total	6,624	5,854	4,583

Both the case rates and the death rates for smallpox vary widely from year to year. The disease now frequently occurs in epidemics which flare up suddenly when the infection is introduced into unvaccinated communities and die out when vaccination deprives the disease of susceptible material.

The following table shows the death rates per 100,000 in the registration area for deaths for the past 25 years, averaged by five-year periods:

Smallpox death rates per 100,000 in the death registration area

1902–1906	2.8
1907–1911	.2
1912–1916	.3
1917–1921	.5
1922–1926	.6

The lowest death rate during these 25 years was 0.1 in 1923, and the highest rate was 6.6 in 1902.

THE OXYGEN DEMAND OF POLLUTED WATERS

RUNNING WATER IS NOT ALWAYS PURE

With a persistence which entitles it to front rank among hygienic fallacies, the idea has long clung to the popular mind that running water, if not always pure, will at least purify itself "in a dozen miles or so." Disastrous consequences following too literal application of this erroneous principle to the selection of municipal water supplies has prompted numerous scientific investigations both here and abroad. A critical review of these researches with a bibliography of over 170 references is given in Part I of a publication entitled "The Oxygen Demand of Polluted Waters," by Chemist Emery J. Theriault, recently issued by the United States Public Health Service as Public Health Bulletin No. 173. Part II of the same bulletin is devoted to the presentation of an extensive series of experiments conducted in the stream pollution laboratories of the Public Health Service.

Briefly, it may be stated that a water contaminated with the organic matters found in sewage and in various industrial wastes does gradually rid itself of such pollution if allowed free access to air. Early studies of this phenomenon of self-purification led to the abandonment of a plausible theory based on the direct action of oxygen on the organic matters, and subsequent research extending over the past 50 years has revealed that the self-purification of streams is essentially a biological process. In this sense the oxygen contained in aerated or running water does not operate as a sterilizing agent, as once believed, but rather as a neutralizing or deodorizing agent for some of the gases resulting from the bacterial decomposition of the organic matters. Dissolved oxygen is also required for the maintenance of fish life. While thus relegated to a secondary rôle, the amount and rate of disappearance of the oxygen which is contained in a given water nevertheless serves as an excellent indicator, first of the threatened disappearance of fish life and, with increasing

pollution, as a warning of impending nuisance conditions. With the understanding that a bacteriological examination is a much better index of wholesomeness or fitness for drinking purposes, it has accordingly become customary to express the pollution of a given water in terms of its demand for dissolved oxygen when reference is made to the threatened disappearance of fish life or to the approach of nuisance conditions.

On the basis of extensive series of observations presented in Part II of Public Health Bulletin No. 173, it has become possible to give numerical expression to the actual rate at which the oxygen demand of a water is satisfied. The outstanding feature of this section of the report is that the rate at which the organic matter is oxidized, while strikingly uniform with a variety of waters, is exceedingly slow. Thus, in a given experiment with Ohio River water collected at Cincinnati, oxygen continued to be used up for fully 300 days and bacteria of intestinal varieties persisted for almost that length of time. Even in the absence of intervening pollution, it would be necessary to allow for a stream flow of several hundred miles before a water, once polluted, could regain its pristine purity. Irrespective of distance from the nearest upstream point of known pollution, it may be safely stated that no river in the United States can now be regarded as hygienically safe without treatment. Conversely, the possibility that a water polluted with sewage might be fully purified by flowing for "a dozen miles or so" becomes too remote for serious consideration.

From a more technical angle, the bulletin under discussion includes data relating to the rate of deoxygenation of polluted river water from which the velocity constants and the temperature coefficient of the underlying biochemical reaction have been computed by the least-squares procedure. The orderliness with which the reaction proceeds compares favorably with that of the purely chemical reactions thus far reported in the literature. This constancy of the rate of deoxygenation of polluted waters is also borne out when the oxygen demand values obtained at various cities are referred to a per capita basis. For the average community, the amount of oxygen required each day for the stabilization of its carbonaceous wastes will be in the neighborhood of 100 grams (0.22 pound) per capita. The findings in this respect are of especial significance, inasmuch as they indicate the possibility of making fair estimates of the ability of a stream to withstand pollution without giving rise to offensive conditions, by a calculation based solely on the contributing population and the volume of stream flow, and without resort to expensive laboratory investigations. Similarly, it would appear possible to estimate the minimum requirements in regard to the treatment of community wastes for the purpose of relieving existing

nuisance conditions. The per capita oxygen demand figure also enters into several other sanitary engineering computations.

Analytical and statistical methods of procedure are given in the four appendices.

This bulletin may be purchased through the Superintendent of Documents, Government Printing Office, Washington, D. C., at 25 cents per copy.

BRITISH COLONIES OF CEYLON, KENYA, AND NIGERIA JOIN INTERNATIONAL OFFICE

The Royal Italian ambassador has officially informed the State Department of the adherence as of January 1, 1928, of the British Colonies of Ceylon, Kenya, and Nigeria to the International agreement signed at Rome December 9, 1907, for the creation in Paris of the Office International d'Hygiène publique.

These colonies have adhered jointly as one unit and have asked to be entered in Class III, with the assessment quota of 15 units as their contribution to the expenses of the office, which will give them the right jointly to appoint a delegate on the Permanent Committee of the International Office.

EXPERIMENTAL BLACK TONGUE OF DOGS AND ITS RELATION TO PELLAGRA

By Joseph Goldberger and G. A. Wheeler, *Surgeons, United States Public Health Service*

CONTENTS

INTRODUCTION [1]

With the beginning of our investigations of pellagra, early in 1914, thought was given to the need for an experimental animal. Accordingly, at our suggestion, Surgeon Edward Francis, United States Public Health Service, beginning December 1, 1914, carried out a

[1] By Joseph Goldberger.

feeding experiment in six rhesus monkeys at the United States Marine Hospital, Savannah, Ga. The diet fed those monkeys consisted of hominy grits, 900 grams (2 pounds); rutabaga turnips, dressed, 3.6 kilograms (8 pounds); sodium chloride, 11 grams (0.4 ounce); sirup (a commercial cane and corn compound), 565 grams (1.25 pounds). The feeding was carried on for eight months—that is, to July 31, 1915. Doctor Francis reported that the animals remained healthy, showing no change other than some loss in weight.

The possibility that the dog might serve our purpose first struck us in 1915, on reading in Chittenden's The Nutrition of Man, (1) among other things, the following:

* * * A dog transferred suddenly from a daily ration in which meat and milk are conspicuous elements to a diet in which these are wholly wanting is very liable to show disturbing symptoms almost immediately. One case may be cited in illustration of these statements. On September 29, 1905, dog No. 17, weighing 18.2 kilos was placed on a daily diet composed of 70 grams of fresh meat, 442 grams of milk, 300 grams of bread, and 28 grams of lard. This ration contained 9.06 grams of nitrogen and had a fuel value of 1,465 calories, or 0.5 gram of nitrogen and 80 calories per kilogram of body weight. On October 11 the animal weighed 18.6 kilograms and was in perfect condition. On the 13th the meat was reduced to 34 grams per day, but the milk was increased in amount so as to maintain the same nitrogen intake and fuel value as before. This diet was continued until November 3, a balance experiment covering 10 days from October 22 to 31, inclusive, showing that the animal was laying by a little nitrogen. On November 3 the diet was changed to milk, bread, and lard, the fuel value being maintained at 80 calories per kilo daily, while the nitrogen intake was reduced to 0.30 gram per kilo. On this diet the animal seemed to thrive perfectly, and at the end of two weeks showed a body weight of 18.2 kilograms. November 19 the milk was withdrawn, the bread being increased so as to keep the daily nitrogen intake and the fuel value unchanged. The day's food was now composed of bread and lard solely, but, as just stated, the nitrogen and fuel values were unaltered. In four days' time, however, a change began to creep over the animal; the appetite diminished, and there was apparent a condition of lassitude and general weakness which deterred the animal from moving about as usual.

During the next week the animal grew steadily worse, and would eat only when coaxed with a little milk or with bread softened with milk, the diet of bread and lard being invariably refused. There was marked disturbance of the gastro-intestinal tract; bloody discharges were frequent; the mucous membrane of the mouth was greatly inflamed and very sore; body weight fell off, and the animal was in a very enfeebled condition. This continued until December 4, with every indication that the animal would not long survive, but by feeding carefully with a little milk and occasionally some meat, improvement finally manifested itself, and by December 18 there was good appetite, provided bread was not conspicuous in the food. * * *

In all of the subsequent months, a small amount of meat was a part of the daily food, but as is seen from the table of balance periods, the total nitrogen intake and the fuel value of the food were reduced to even lower levels per kilogram of body weight. Yet the animal gained steadily, until at the latter part of June the weight was considerably above that noted at the commencement of the experiment in the preceding October. Further, the animal was in nitrogen equilibrium or even gaining nitrogen, and in perfect condition of health and

vigor, as is indicated by the accompanying photographs taken at the different periods stated. Especially to be emphasized is the fact that during the last six months of the experiment, the daily intake of nitrogen and the fuel value of the food were as low as or even lower than in November, when the daily diet was limited to bread and lard. The disastrous result which showed itself at once on this latter diet, with all animal food excluded, was not due to low proteid or to deficiency in fuel value, but simply to the fact that the animal for some reason could not adjust itself to a simple dietary of bread and fat, although there was ample available nitrogen and fuel value for the body's needs. Something was lacking, which meat or milk could supply, and this something was indispensable for the maintenance of the normal nutritional rhythm.

This is by no means an exceptional case, but we can cite many other examples of like results where the animal when restricted to a purely vegetable diet, such as bread, pea soup, bean soup, etc., reinforced by an animal fat, quickly passed from a condition of health into a state of utter wretchedness, with serious gastrointestinal disturbance. * * *

The disturbance of the gastrointestinal tract with inflammation of the mucous membrane of the mouth was to us very suggestive of pellagra, a resemblance that was enhanced by the preventive and curative action attributed by Chittenden to meat and milk feeding, for we had already at that time been impressed with the evidence of a relation between diet and pellagra and with the therapeutic and preventive value of the fresh animal foods in the human disease (2).

Accordingly, at the first opportunity, which came late in the summer of 1916, one of us (J. G.), in association with Dr. Atherton Seidell, tried to repeat Chittenden's experiment in dogs with a bread and lard diet, but without significant result. It was not practicable to do anything more until the summer of 1918. In the meantime Chittenden and Underhill had published a report on "The production in dogs of a pathological condition which closely resembles human pellagra" by means of a diet of boiled peas, cracker meal, and cottonseed oil (3), so that on resuming the study Goldberger and Seidell tried feeding some dogs with the Chittenden-Underhill diet, but again without obtaining significant results. The one experiment that was made was carried on for but three months, at the end of which period it was again found necessary to interrupt this line of investigation.

Work on the problem of an experimental animal for pellagra was not again taken up until early in January, 1922. The dog was again selected for study, but the feeding, it was now decided, should be with a diet of the type that had been found associated with the occurrence of pellagra and believed to be pellagra producing. Accordingly, now in association with Surg. G. C. Lake, United States Public Health Service, the senior writer (J. G.) carried out the following experiment:

On January , 1922, six dogs began to be fed with a diet having the following composition:

Hominy grits	grams	200
Wheat farina	do	57
White rice	do	28
Cowpeas (California black-eye)	do	14
Milk (Pasteurized, market)	cubic centimeters	30
Lard	grams	21
Gelatine	do	40
Sodium chloride	do	10
Calcium carbonate	do	3
Cod-liver oil	cubic centimeters	28
Tomato juice (canned tomatoes)	do	115

The cowpeas were first cooked in tap water for 30 minutes, then the grits, farina (which was used as a substitute for wheat flour), rice, and salt were added and the cooking was continued in a double boiler for about another 40 minutes. At the end of this time the pot of food was withdrawn from the flame and the remaining ingredients were well stirred in. A suitable portion of this diet was served each dog once a day. With the idea of stimulating the appetite, a cake of commercial compressed yeast (about 15 grams) was offered each animal with its daily ration. As, in spite of this, the animals were not eating as well as was thought desirable, the allowance of yeast was later (June 14, 1922) doubled.

One of the six animals having developed an ugly temper, it was chloroformed on August 4, 1922. It had presented nothing of significance up to the time it was killed. On November 9, 1922, the feeding of the remaining five dogs was discontinued. All of them had lost weight and had developed sarcoptic mange, but none presented any other significant pathological change.

This failure, though in a sense disappointing, was not considered conclusive; it was therefore decided to repeat the experiment as soon as the animals were again in good condition.

The experimental feeding in dogs was resumed about the middle of January, 1923, and has been in progress ever since, now in association with the junior author (G. A. W.), who relieved Surgeon Lake about September, 1922, by reason of service exigency requiring the latter's assignment to other duty. In the present communication it is desired to report some of the results obtained.

EXPERIMENTAL FEEDING

EXPERIMENT 1

Our first experiment, essentially a repetition of the one carried out in 1922, was begun on January 16, 1923, with test diet No. 33. (Table 1.) In composition this was essentially the same as the diet used in the 1922 experiment, with the exception that it contained no milk and was not supplemented with yeast. Four days later, that is, on January 20, its composition was modified by reducing the amount

of the cod-liver oil and replacing it with cotton-seed oil, thus making diet No. 34 (Table 2), which was continued without further change to the end. This diet was constructed as a simplified replica of a type of diet found in our field studies in association with and (unless suitably supplemented) believed to be responsible for the occurrence of pellagra (4).

Diets associated with pellagra not infrequently contain some milk and a small amount of some meat; but since we had reason to believe that milk and meat possessed pellagra-preventive properties, and as we desired to work with as potent a pellagra-producing diet as possible, we thought best to exclude milk and meat altogether. As yeast does not ordinarily enter into the diet of the people subject to pellagra, even in their bread, it was thought best on general principles not again to use this even to stimulate the appetite. We had at that time no definite suspicion that it might possess pellagra-preventive action. We included gelatin, first, because we felt that the diet of a normally high-protein-feeding animal should perhaps contain more protein than the diet without some such element would afford, and, second, because at that time we were inclined to believe that the primary etiological dietary fault related to pellagra was an amino acid deficiency, and tests of gelatin in pellagra had already shown that it lacked beneficial therapeutic properties in that disease (4). Wheat farina was used as a substitute for wheat flour in order to avoid as much as possible giving the cooked food mixture a gummy character. The sodium chloride and calcium carbonate were included, with a view to improving the mineral content of the diet, and the cod-liver oil to supply an abundance of the vitamines that might be needed by animals that were to be confined indoors. Incidentally, the cod-liver oil was, in part at least, a substitute for the butter that is at times present in pellagra-producing diets. The canned tomato juice was assumed to be the equivalent of the variable fresh vegetable component of the type of diet ordinarily associated with pellagra.

Five dogs, numbered 1, 2, 5, 6, and 7, were used as test animals. Each animal was kept in a kennel in a room of one of the laboratory buildings. The sides and door of the kennel were of coarse wire screening on a wooden frame. The brick wall of the room formed the back. The floor of the kennel (that of the room) was of concrete. Horizontally across the back of each kennel, about a foot above the floor, there was fastened a board to serve as a bench. The kennel was cleaned daily by freely flushing with water. At irregular intervals the kennels were mopped with soap or disinfectant solution followed by water.

Each animal was provided with fresh drinking water daily, at first in an enameled pan, later in a galvanized iron pot. A weighed amount of the cooked food for one day was served in a similar recepta-

cle. What remained unconsumed at the end of 24 hours was weighed back and thus the daily food consumption was determined. The amount of food offered was, in general, all that the animal would eat.

The effect of this feeding is presented in detail for each animal in the following:

Dog 1.—Male. Acquired December 5, 1921; was one of the test animals in the feeding experiment of 1922.

January 16, 1923: In good condition; weighs 11.1 kilograms; begins test diet No. 33.

January 20: Begins test diet No. 34.

March 8: Food consumption markedly reduced during the past four or five days. There is present to-day a noticeable excess of saliva. The mucosa of the gums of the lower jaw and of the adjacent portions of the floor of the mouth shows irregular patches of congestion.

March 9: Weight, 9.5 kilograms.

March 10: Ate all his food yesterday. The salivation and the reddening of the buccal mucosa have subsided.

March 23: Eyes are slightly watery.

March 30: There is pronounced lachrymation. After a period of about five days from March 9 to March 14 during which the food consumption was consistently excellent, the food taking (appetite) became capricious and has oscillated considerably from day to day. There is present this morning a reddening of the mucosa of the upper lip and of the gums in the region of the oral commissures. The skin of the scrotum appears dry and some flaky desquamation is present. Weight 10.2 kilograms. Temperature at 10 a. m., 38.6°; at 8.45 p. m., 38.7°.

March 31: The skin of the scrotum is desquamating. Temperature at 12 m., 38.1°; at 8.30 p. m., 38.3°.

April 1: Eyes continue slightly watery. Temperature at 10 a. m., 37.7°; at 5 p. m., 38.4°.

April 2: The eyes are watery. There is slight congestion of the mucosa of the anterior portion of the floor of the mouth and of the cheeks. Slight buccal odor. Condition of scrotum unchanged. Weight 9.8 kilograms. Temperature at 12 m., 38.1°; at 5 p. m., 38.1°.

April 3: Over the anterior part of the central half of the skin of the scrotum there is present a slight streaky reddening and scaling. The posterior third of the scrotal skin is pigmented black so that it is not certain whether this is reddened, but there is present a slight but definite scaling over nearly the entire ventral aspect of the scrotum which appears dry. Condition of mouth unchanged. Has eaten very little during the past two days. Temperature at 10 a. m., 38.1°; at 4.45 p. m., 38.1°.

April 4: Scrotal lesion appears unchanged. At about the level of the line of occlusion of the teeth the mucosa of each cheek presents a brownish streak about 3 or 4 millimeters wide. This appears to represent an area of superficial necrosis. The mucosa of the base of the tongue, of the soft palate, and of the fauces appears somewhat similarly affected. Buccal odor is quite fetid. Temperature at 10 a. m., 38°; at 4.45 p. m., 38.3°.

April 5: The condition of the scrotum and that of the mouth are about as they were yesterday. Temperature at 10 a. m., 37.8°; at 4.30 p. m., 38.2°. Was offered about 200 cubic centimeters of fresh milk.

April 6: Condition of scrotum and mouth shows no marked change. Buccal odor continues fetid. Lapped a little of the milk offered. Weight 9.6 kilograms. Temperature at 10 a. m., 38.5°; at 4.30 p. m., 37.9°.

April 7: This morning the reddening of the buccal mucosa appears more pronounced than yesterday. The necrotic areas continue present. There is a moderate increase of saliva without drooling. Buccal odor continues fetid. Lapped but little if any milk since yesterday, but ate a little of the cooked food.

This afternoon there are found patches of redness on the mucosa of the upper lip on each side in the region of the canines. Temperature at 10 a. m., 38.8°; at 4.35 p. m., 38.5°.

April 8: The affected area of buccal mucosa has become more extensive and the inflammation more pronounced. Temperature at 11 a. m., 38.6°.

April 9: There is no notable change. Food consumption has for a week or more been quite irregular and small in amount. Had a hard bowel evacuation during last night. Temperature at 10.30 a. m., 38.2°; at 4.20 p. m., 39.1°.

April 10: The previously noted reddened patches on the mucosa of the upper lip have developed into a sharply delimited band on each side, extending from about the region of the canines back to the cheeks, where they merge in the reddened necrotic lesion of the buccal mucosa. There is slight drolling and pronounced buccal fetor. The skin of the scrotum appears more reddened, and desquamation continues. Had a large, partly formed bowel evacuation during the day. Temperature at 10.30 a. m., 39.1°; at 4.20 p. m., 39.8°. Temperature began to rise yesterday afternoon.

April 11: The inflammation of the mouth now includes the margin of the tongue. There is moderate drooling. Buccal odor is foul. Passed soft blood-stained stool at 4.30 p. m. Temperature at 9.30 a. m., 40°; at 4.20 p. m., 40.7°.

April 12: Has a weakened, dejected appearance this morning. Passed a diarrheal, blood-stained stool during the night with which he is extensively soiled. Buccal mucosa more severely inflamed and necrotic. Marked oral fetor and slight drooling are present. The scrotum shows a pronounced erythematous fringe along the anterior and lateral borders of the desquamating area. The posterior limit of this area is obscured by black pigmentation. There is increased drooling and there have been several diarrheal evacuations during the afternoon. Has eaten nothing since April 9. Temperature at 10 a. m., 40.7°; at 4 p. m., 40.9°.

April 13: Found dead at 7.30 a. m.

Necropsy.—A male fox terrier apparently in good state of nutrition. Weighs 8.3 kilograms. *Rigor mortis* is fairly established. Subcutaneous fat about normal. Skin of the scrotum is dry, red, and scaly. The anterior and lateral limits of the affected scrotal area are well defined; the posterior limit is obscured by dark, normal pigmentation.

The entire buccal mucosa, except that of the anterior portion of the tongue and hard palate, appears, on inspection, to be inflamed and necrotic. The same process involves the mucosa of the pharynx, nasopharynx, larynx, including the glottis and epiglottis, and of about the upper 2 inches of the esophagus. The necrosis seems to be more marked on the mucosa of the cheeks, the base of the tongue, and the soft palate.

The pleurae appear normal. There appears to be some congestion, probably hypostatic, at the base of the lower lobe of the left lung. There is a small hemorrhagic spot with whitish center on the surface of the upper lobe of the right lung. The lower border of the lower lobe of the right lung shows some hypostatic congestion.

The heart and pericardial membranes appear normal.

The liver, spleen, pancreas, kidneys, urinary bladder, and testes appear normal.

The stomach and intestines show an occasional small subserous capillary hemorrhage; otherwise they appear negative on external inspection.

Except for the involvement of the upper 2 inches, to which reference has been made, the mucosa of the esophagus seems normal.

The mucosa of the stomach is markedly congested, with submucous hemorrhages over a rather large area about the pylorus and along the greater curvature.

The small intestine contains a small amount of bile-stained mucus. Scattered throughout the upper half of this gut there are seen small submucous hemorrhages. These coalesce here and there to form small hemorrhagic patches.

The colon contains a small amount of yellowish, slimy mucus. The mucosa is congested and presents numerous submucous hemorrhages. The cecum is similarly affected, but to a lesser degree.

The rectum is empty and is markedly congested with numerous submucous hemorrhages throughout its length. The portion just within the anus presents what appears to be the same process as that seen in the buccal cavity.

Dog 2.—Male. Acquired December 5, 1921; was one of the test animals in the feeding experiment of 1922.

January 16, 1923: In good condition; weighs 8.5 kilograms; begins test diet No. 33.
January 20: Begins test diet No. 34.
February 23: Weight 7.3 kilograms.
March 8: Food consumption since the beginning of this month has been somewhat diminished as compared with that of February. The mucosa of the outer surface of the gums, both upper and lower on both sides, shows areas of redness. The mucosa of the cheeks also is reddened.
March 9: Weight, 8 kilograms.
March 10: The erythema of the mucosa of the gums and cheeks has faded almost completely.
March 22: Has been eating very little during the past five or six days.
March 23: Eyes are slightly watery. The scrotal skin is dry and desquamating in large flakes. Weight, 6.7 kilograms.
March 29: Has eaten little or nothing during the past three days. The mucosa of the upper lip, on both sides, is reddened. The mucosa of the cheeks and of the floor of the mouth is also reddened. All reddened areas have an angry appearance not unlike a severe pellagrous stomatitis. The reddening is not of uniform intensity, there being some patches almost hemorrhagic in appearance, with an irregular grayish surface film resembling a false membrane that is fairly easily wiped off. A fetid buccal odor is present. Buccal secretion is increased. The scrotum shows the remains of a dry, flaky desquamation.
March 30: Has eaten nothing during the past two days. Is lying down and appears disinclined to stand up. Has a listless and dejected look. Buccal odor is very fetid. The outer surface of the jaw is soiled with buccal secretion. The lower lip at the angles of the mouth seems slightly swollen and sags so that the reddened margin is exposed to view. At 5.20 p. m. forced to swallow a bolus containing 10 grams of Seidell's activated solid, immediately after which was seized with a convulsion of a clonic type. Five hours later was forced to swallow a second bolus containing 15 grams of activated solid.

The buccal mucosa is markedly reddened with many eroded spots and with a grayish-amber gelatinous accumulation over large areas of its surface. Has not eaten nor have bowels moved during the past 36 hours. Scrotal condition is unchanged. Temperature at 10 a .m., 40.9°; at 9.25 p. m., 40.7°.
March 31: Appears weaker. Is not eating. Drooling a stringy buccal secretion. Buccal odor continues foul. Buccal mucosa is inflamed, necrotic, and in places ulcerated. Passed a small hard stool coated with blood during the forenoon. About 8.30 p. m. vomited the boluses given yesterday. Passed a soft stool. Temperature at 12 m., 39.2°; at 8.30 p. m., 38.2°.
April 1: Found dead this morning.

Necropsy.—The skin of the scrotum is freshly desquamated with a few partly adherent, thin, dry scales about the periphery. Otherwise, there is nothing of importance on inspection.

The upper surface of the tongue is not appreciably changed from the normal, but the margins at about the interdental space are intensely congested. The under surface of the tongue is congested and of a dark blue color. The floor of the mouth is intensely congested. The pharyngeal, naso-pharyngeal, and laryngeal mucosa and the base of the tongue are intensely congested and present patches of superficial necrosis, as indicated by the presence of patches of a grayish membrane. The hard palate is not appreciably affected. The soft palate is intensely congested. The intensely inflamed mucosa of the lips, gums, and cheeks has a grayish necrotic appearance.

The right lung shows some congestion at the apex and at the base of the middle and lower lobes. The left lung shows hypostatic congestion. The heart seems normal.

The liver, spleen, pancreas, and kidneys appear normal.

The mucosa of the esophagus appears slightly congested. The stomach contains some liquid in which there is a little of what appears to have been part of the bolus of activated solid administered in the evening of March 30. The mucosa presents irregular intensely congested patches near the pylorus and along the lesser curvature.

The small intestine contains a small amount of bile-stained fluid. The upper and middle portions present small irregular patches of congested mucosa.

Under the peritoneal surface of the upper part of the colon there are punctate hemorrhages. Corresponding to the sites of these are seen patches of markedly congested mucosa. The mucosa of the rectum appears normal.

The mucosa of the fundus of the urinary bladder appears congested.

Dog 5.—Bitch. Acquired November 8, 1921; was one of the test animals in the feeding experiment of 1922.

January 16, 1923: In good condition; weighs 8.6 kilograms; begins test diet No. 33.

January 20: Begins test diet No. 34.

January 26: Has been in heat for past three days.

March 23: Weight, 8.3 kilograms.

March 30: Buccal mucosa possibly somewhat reddened. There are four dirty grayish irregular patches on the mucosa of the upper lip; one opposite each canine tooth. Food consumption (appetite) has been much reduced during the past 10 days. Weighs 7.5 kilograms.

No indication of bowel action to-day. Temperature at 10 a. m., 38.6°; at 8.55 p. m., 38.3°.

March 31: No notable change. Temperature at 12 m., 38.5°; at 8.30 p. m., 38.3°.

April 1: No notable change. Temperature at 10 a. m., 38.3°; at 5 p. m., 38.5°.

April 2: Buccal mucosa is inflamed with a necrotic process affecting an antero-posterior elongated area in the region of the molar teeth. Markedly fetid buccal odor is present. Has eaten nothing since March 28. Weight, 7.1 kilograms. Temperature at 12 m., 38.2°; at 5 p. m., 38°.

April 3: The lips and gums show increased redness. The posterior portion of the dorsum of the tongue and the soft palate are decidedly reddened. Had a loose bowel movement during the night. Temperature at 10 a. m., 37.6°; at 4.45 p. m., 38.1°.

April 4: There is some drooling of saliva. Seems weaker. Had a clonic convulsion about noon lasting one-half to one minute. Not eating. Temperature at 10 a. m., 38.1°; at 4.45 p. m., 38.5°.

April 5: Condition not notably changed. Temperature at 10 a. m., 38.6°; at 4.30 p. m., 38.5°. Not eating.

April 6: Appears less dejected. Salivation less marked. Not eating. Weight, 6.8 kilograms. Temperature at 10 a. m., 38.5°; at 4.30 p. m., 38.5°.

April 7: No notable change in condition. Passed small, semiliquid stool during the night. Has eaten nothing since March 28. Temperature at 10 a. m., 38.4°; at 4.35 p. m., 38.6°.

April 13: No notable change in condition during the past week. Not eating. Becoming noticeably emaciated. Weight, 6.1 kilograms. Temperature at 10.20 a. m., 38.3°; at 4.20 p. m., 38.6°.

April 14: Seems weaker. There is a perceptible increase in buccal secretion but without drooling. Condition of buccal mucosa about as previously noted, but the necrotic areas seem to have become somewhat cleaner during the past few days as if tending to heal. Passed a dark, semisolid stool during the night.

The afternoon examination shows evidence of a definite increase in buccal secretion, nearly all of which is apparently swallowed. There is also present a beginning reddening of the labiogingival fold of the upper lip on both sides in the region opposite the canines and the interdental spaces. The mucosa of the cheeks, especially that just back of the angles of the lips, also shows a definite increase in redness. Temperature at 10.30 a. m., 38.2°; at 4.15 p. m., 38.6°.

April 15: The changes in condition observed yesterday afternoon are all more pronounced this morning. In addition, oral fetor has become marked. Very slight drooling. Passed a small, dark-colored semisolid stool this morning. Has eaten nothing since March 28. The test diet is discontinued. Was induced to eat about 20 grams of finely ground fresh lean beef. Temperature at 10 a. m., 38.6°.

April 16: About as noted yesterday except for a possible further increase in the redness of the mucosa of the cheeks and of the upper lip. Passed two diarrheal stools during the night. Was induced to take about 100 grams of fresh beef during the day; ate nothing else. Temperature at 10 a. m., 38.4°; at 4 p. m., 38.6°.

April 18: Has voluntarily taken a little cooked food containing some fresh beef. General condition seems better. The condition of the buccal mucosa seems better, less red.

April 20: There has been a pronounced change for the better in the condition of this animal during the past 36 hours. The inflamed condition of the mouth has improved markedly. Buccal odor much less fetid. Salivation has ceased. Appears livelier than for some time. Eating better of the cooked food containing fresh beef. Has gained slightly in weight during the past week. Weight 6.4 kilograms.

April 27: Condition of the mouth is again about normal. Bowel movements normal. Further history not relevant.

Dog 6.—Bitch. Acquired December 15, 1921. Was one of the test animals in the feeding experiment of 1922.

January 16, 1923: In good condition; weighs 12.6 kilograms; begins test diet No. 33.

January 20: Begins test diet No. 34.

February 14: Threw a litter of 6 pups, 2 of which were dead and macerated; the other 4 died within 24 hours.

March 30: Food consumption (appetite) has been somewhat reduced during the past week. Weighs 10.9 kilograms. The mucosa of the upper lip shows on both sides a sharply delimited band of erythema which in width extends from a little within the free margin of the lip to the labiogingival fold and, in length, from the median line to about the region of the labial commissures. Temperature at 10 a. m., 39.1°; at 9.10 p. m., 38.8°.

March 31: Buccal mucosa about as yesterday. Temperature at 12 m. 39.2°; at 8.30 p. m., 38.8°.

April 1: Reddened bands on upper lip appear about as already noted but there has developed in the past 24 hours a small oval dirty patch on each side in region of apposition to canines. Fetid buccal odor is present. Refused all food yesterday. Temperature at 10 a. m., 39°; at 5 p. m., 39.1°.

April 2: No notable change in condition of the mucosa of the upper lip. The mucosa of the cheeks and the posterior portion of the margin of the tongue have become red. Fetidity of buccal odor is marked. Ate nothing yesterday. Weighs 10.5 kilograms. Temperature at 12 m. 38.9°; at 5 p. m., 39.3°.

April 3: The mucosa of the cheeks presents an irregular patch of superficial necrosis. Ate a small amount of food yesterday. Temperature at 10 a. m., 39.6°; at 4.45 p. m., 38.1°.

April 4: During the past 16 hours the inflammation of the buccal mucosa has taken on a more angry appearance. There have appeared here and there over the affected area brownish necrotic patches of varying form and extent. This process is now present across the mucosa of the soft palate and on that of the upper lip. Buccal secretaion is increased; odor is fetid. Ate a small amount of food yesterday. Temperature at 10 a. m., 40.3°; at 4.45 p. m., 40.0°.

April 5: Ate nothing yesterday. Buccal secretion is profuse; odor is strong. Mouth more markedly affected. The tip and lateral margins of the tongue are reddened. Temperature at 10 a. m., 40.3°; at 4.30 p. m., 40.4°.

April 6: Inflamed condition of the mouth appears to have become more marked; drooling is excessive; odor marked. Ate nothing yesterday. Weighs 9.8 kilograms. Temperature at 10 a. m., 40.3°; at 4.30 p. m., 40.5°.

April 7: Condition of the buccal mucosa has become worse. There is decided increase in the redness of the margin of the tongue, including a narrow strip (about 3 or 4 millimeters wide) of the dorsal aspect of the margin all the way around including the tip; marked drooling of blood-tinged secretion. Buccal odor extremely foul. Has eaten nothing in 72 hours. Temperature at 10 a. m., 40.1°; at 4.35 p. m., 39.4°.

April 8: General condition and mouth symptoms seem worse this morning. Not eating. Temperature at 11 a. m., 36.6°.

April 9: Found dead about midnight last night.

Necropsy.—An apparently well-nourished fox terrior bitch.

The fur of the legs, tail, and sides extensively soiled with saliva. Marked fetid odor about the mouth. Both eyes sunken. Subcutaneous fat abundant.

The mucosa of the lips, gums, floor of the mouth, of all of the tongue except a median strip of the anterior portion of the dorsal surface, of the pharynx, posterior portion of the naso-pharynx; of the larynx, including the glottis and epiglottis and of the soft palate is intensely inflamed and necrotic, with a dirty yellowish slimy layer of necrotic mucosa throughout most of these parts.

The left lung appears normal; the right shows areas of hypostatic congestion in portions of all three lobes. The trachea and larger bronchi seem normal. The pericardium and heart are apparently normal.

The liver, pancreas, and kidneys seem normal. The spleen is perhaps smaller than normal; the central portion is, perhaps, slightly contracted. There are many irregular dark-blue patches scattered throughout.

There is slight injection of the mucosa of the lower portion of the esophagus particularly near the cardiac orifice.

The stomach contains a small amount of bile-stained mucus. The mucosa is slightly injected near the pylorus and along the greater curvature.

The small intestine contains a small quantity of yellowish slimy mucus in places tinged with blood. Along about 3 inches of its length at about the junction of the upper and middle thirds there are scattered some punctate hemorrhages. There are diffuse submucous hemorrhages in the upper portion with here and there circumscribed areas with apparently a beginning necrosis.

The colon contains a small amount of soft, blood-stained feces. The mucosa of the upper portion, including the cecum, is injected, possibly with fine submucous hemorrhages.

The rectum is partly filled with semisolid feces. There is slight congestion of the mucosa near the anal orifice.

The urinary bladder is contracted with the mucosa of the fundus slightly injected.

Genitalia, apparently normal.

Dog 7.—Male. Acquired December 29, 1922.

January 16, 1923: In good condition; weighs 16.8 kilograms; begins test diet No. 33.

January 20: Begins test diet No. 34.

February 9: Eating well. Weighs 18.4 kilograms.

March 9: Nothing notable. Weighs 19.1 kilograms.

March 23: Food consumption has been considerably diminished during the past week. Weighs 19.7 kilograms.

March 29: Food consumption has continued at a reduced though irregular rate. There is some salivation present this morning. The mucosa of the mouth is generally flushed, with marked reddening of that portion of the mucosa of the upper lip that is in opposition to the gum. This reddened area is clearly delimited from the rest of the mucosa of the lip. The mucosa of the soft palate also is notably reddened. A foul buccal odor is present. The nose is moist and there is slight lachrymation.

March 30: The animal appears decidedly weaker than yesterday; disinclined to get up on feet. Eyes are moist; the conjunctivae are reddened. A slight watery nasal discharge is present. There is pronounced drooling of ropy saliva. The lower lip at the angles sags so that the reddened margin is exposed and permits the stringy buccal secretion to flow out. The mouth is more inflamed. The margin and base of the tongue are inflamed but the dorsal surface is not appreciably altered. The anterior portion of the scrotal skin shows a slight reddening and bran-like desquamation. At 5.20 p. m. given 10 grams of Seidell's activated solid in a bolus of graham flour, cornstarch, and cottonseed oil. At 10.10 p. m. given a second bolus containing approximately 15 grams of Seidell's activated solid. Weighs 18.1 kilograms. Temperature at 10 a. m., 39.9°; at 9.35 p. m., 40.7°.

March 31: Has hiccough this morning. Is drooling copiously. Buccal odor is very foul. Has eaten little or nothing during the past three days. Given about 200 cubic centimeters of milk by drench. Temperature at 12 m., 40.2°; at 8.30 p. m., 40.7°.

April 1: Appears considerably weaker. Ate nothing yesterday other than the milk given by drench. Buccal mucosa is more necrotic. The scrotum continues to show desquamation with the anterior and anterolateral margins of the affected area well defined. Had a diarrheal stool last night. Temperature at 10 a. m., 39.5°; at 5 p. m., 39.5°.

April 2: Found dead this morning.

Necropsy.—A large, seemingly well nourished male. Rigor well established. The fur about the mouth is soiled, apparently with buccal secretion; there is a foul odor from the mouth. Sclerae are markedly injected. The anterior part of the scrotum shows an area of erythema and desquamation which is sharply delimited anteriorly.

A considerable subcutaneous fat layer is present.

The mucosa of the upper lip shows evidence of severe inflammation; irregular areas have undergone a necrotic process which gives the appearance of a false membrane. A similar process has affected the mucosa of the lower lip, of the cheeks, of the margin, under surface and posterior portion of the dorsum of the tongue, of the soft palate, of the pharynx, naso-pharynx, larynx, glottis, and epiglottis.

There are fine subpleural ecchymoses below the fourth intercostal space. The left lung is collapsed and shows small areas of hypostatic congestion and consolidation near the margin of the lower lobe.

The upper lobe of the right lung seems normal. The middle lobe of this lung is consolidated and there are small areas of consolidation in the lower lobe. Section of the consolidated areas shows small grayish patches.

The pericardium shows fine capillary hemorrhages. The epicardium shows similar hemorrhages which appear most marked over the interventricular groove and coronary areas.

A rather large quantity of fat is present in the omentum. There are to be observed very fine subserous hemorrhages scattered throughout the length of the intestine.

The liver is about of normal size and is perhaps slightly congested. The kidneys and spleen seem normal. The pancreas presents a suggestion of very fine capillary ecchymosis.

The esophagus appears normal. The vessels of the stomach are injected with what seem to be fine subserous hemorrhages. The mucosa is markedly congested particularly in the pyloric region. The organ contains a small amount of dark green, foul smelling liquid.

Along the middle portion of the small intestine there are scattered small submucous hemorrhages which are more marked in the upper part.

The mucosa of the cecum seems slightly injected; whip worms are present. The large gut is practically empty; its mucosa is injected throughout with numerous fine capillary hemorrhages.

The urinary bladder is contracted. It contains a small amount of urine. There is considerable injection of the mucosa of the fundus.

Testes are apparently normal.

Thus, in from 51 to 73 days after beginning the test, all five animals developed a condition which, certain variations aside, had the same outstanding characters in each. Four of the dogs died; one recovered.

The animals, when sick or at postmortem, or both, were also seen by Drs. Leigh T. Giltner and Jacob E. Shillinger of the Bureau of Animal Industry of the United States Department of Agriculture, and by Dr. M. R. Blackstock, veterinarian, of Spartanburg, S. C. All agreed with us that the condition presented was clinically indistinguishable from that occurring spontaneously in dogs and known to American veterinarians as black tongue.

Athough the study which may be said to have been initiated by the foregoing experiment has been carried on steadily ever since, nearly

four years elapsed before experiment 1, as such, was actually repeated. In its repetition it was found convenient to construct the test diet on a 2,400 instead of the original 1,620 calorie basis, and to use a corn meal of a slightly different character. The test diet was therefore given a different serial number, namely No. 288. (Table 3.) The essential details of the experiment as repeated are set forth in the following:

EXPERIMENT 2 [2]

The methods of caring for, feeding, and observing the test animals were essentially the same as described under experiment 1. Five dogs, numbered 38, 44, 50, 93, and 97, were the test animals. The effect of this feeding is presented in the following for each of the animals:

Dog 38.—Male. Was one of a litter whelped in the laboratory June 26, 1923. Served in various experiments (see experiment 3) and suffered several attacks of experimental black tongue,[3] the latest beginning July 19, 1924. On stock diet No. 156 (Table 4) from March 15, 1927, to April 6, 1927.

April 6, 1927: In good condition; weighs 11.5 kilograms. Begins experimental diet No. 288.

May 3, 1927: Food consumption has been excellent; weighs 12 kilograms.

May 7: Food consumption has continued excellent. Presents a distinctly reddened band or streak about 2 millimeters wide and about 1 centimeter long on the mucosa of the upper lip on each side in the region of the molar teeth. On the right side there is also a reddened irregular circular patch opposite the canine teeth.

May 8: The reddened streaks on the mucosa of the posterior part of the upper lip of each side have extended forward appreciably. The mucosa of the floor of the mouth is slightly injected. Mouth is otherwise about as yesterday. Temperature at 10 a. m., 37.7°.

May 9: The mucosa of the upper lip presents, on the right side, a row of three well-marked and vividly red patches, the middle one of which is opposite the canine teeth; on the left side it likewise presents a row of three reddened patches but these are not so sharply outlined nor so bright as those on the right side. The mucosa of the floor is definitely injected. Temperature at 10.20 a. m., 39.2°.

May 10: The mucosa of the right side of the upper lip continues about as yesterday except that the posterior one of the reddened patches has elongated somewhat and is now continuous with a reddening of the mucosa of the cheek. The reddened patches on the left side of the upper lip are less distinct than yesterday except the posterior one, which has likewise elongated and become continuous, with a flushing of the mucosa of the corresponding cheek. The mucosa of the floor of the mouth continues injected and the anterior faucial pillars have become somewhat reddened. Food consumption continues excellent; weight is 12.2 kilograms. Temperature at 10.32 a. m., 38.9°.

May 11: Mouth appears about as it did yesterday. Temperature at 10.10 a. m., 38.8°.

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[2] By Joseph Goldberger and L. M. Rogers.

[3] This designation of the experimental disease is here used as a matter of convenience and without prejudice to the question of its identity with the spontaneous disease of this name, presently to be considered.

May 14: The red patches on the mucosa of the upper lip tend to coalesce and to form a band on both sides. The floor of the mouth continues injected. Food consumption was excellent until yesterday when for the first time in fully a month a portion of the daily allowance was left. Temperature at 10 a. m., 38.4°.

May 15: The mucosa of the upper lip on each side now presents a bright red band extending from the cheeks forward to the median line. The cheeks, anterior pillars, and floor of the mouth have become notably more red. There are present small areas of superficial necrotic membrane within the reddened areas on the mucosa of the upper lip; the mucosa of each cheek is fairly well covered with a similar membraneous film. Ate less than half of the food allowance yesterday. Temperature at 9.30 a. m., 39.7°.

May 16: Mouth lesions are about as yesterday but seemingly not so vividly red. The margins of the tongue are reddened and necrotic. There is some salivation and a foul buccal odor is present. Ate nothing yesterday. Temperature at 9.35 a. m., 40.4°; at 2.30 p. m., 40.5°.

May 17: Condition of the mouth is about as yesterday. Not eating. Weighs 10.8 kilograms. Temperature at 8.50 a. m., 41°; at 3.15 p. m. 40.8°.

May 18: Inflamed and necrotic condition of mucosa of lip and mouth is, if anything, more pronounced. Salivation is more pronounced. Seems depressed and weak. When taking the morning temperature the bulb of the thermometer was soiled with thin, brownish feces. At 5 p. m. vomited a moderate amount of thin mucoid fluid. Not eating. Temperature at 9.15 a. m., 41°; at 2.55 p. m. 41.6°; at 5 p. m., 41.2°.

May 19: Found dead this morning.

Necropsy.—A seemingly well-nourished animal with a moderate layer of subcutaneous fat and a fair amount of omental and perirenal fat.

The mouth is as observed during life, but the affected mucosa appears here and there of a dark blue tint.

The esophagus presents nothing of note. There is some injection of the gastric mucosa near the pylorus. The small intestine contains some yellowish brown mucous and two or three hookworms. The large intestine presents nothing of special note; the distal portion contains some semisolid feces.

The liver, pancreas, spleen, and kidneys present nothing of note.

The pleural cavities appear normal. The lungs are crepitant, but the right middle lobe and the lower anterior portion of the left upper lobe each presents a dark blue patch of congestion.

The heart and pericardium present nothing of note.

Dog 44.—Male. Was one of litter whelped in the laboratory June 26, 1923. Served in various experiments and suffered several attacks of experimental black tongue, the latest beginning February 4, 1926. On stock diet No. 156 (Table 4) from March 15, 1927, to April 6, 1927.

April 6, 1927: In good condition; weighs 11.8 kilograms. Begins experimental diet No. 288.

May 27: Food consumption has been excellent. On the ventral aspect of the scrotum there is present at about the center an irregular erythematous patch about 2 centimeters in diameter; to the right of this is present another similar but smaller patch.

May 29: The smaller scrotal patch of erythema has faded out while the larger has paled somewhat.

May 30: Scrotal erythema has not notably changed.

May 31: Has continued to eat well. Weight has oscillated between 11.4 and 11.8 kilograms.

June 1: The scrotal erythematous patch seems to have faded at the center and to have extended somewhat peripherally so that there is now present an irregular ringlike band, the band being about 1 centimeter in width.

June 3: The scrotal erythema is again in the form of an irregularly circular patch, the center of the ring having become reddened. The affected skin is dry, with some accumulation of a dried material, possibly of serous exudate.

June 5: Scrotal lesion less red and there is a beginning exfoliation of large flakes.

June 7: Periphery of scrotal lesion is again reddened; desquamation is in progress.

June 10: Scrotal lesion is much less red; desquamation is nearly completed except for a few adhering tabs at the periphery of the lesion.

June 12: Scrotal lesion persists without notable change.

June 13: Scrotal lesion not so red as yesterday.

June 14: Area involved by scrotal lesion has extended and is more red than yesterday.

June 17: Scrotal lesion continues red; there is some desquamation.

June 19: Desquamation of scrotal lesion continues and is in large flakes.

June 23: Scrotal lesion not quite so red as it has been during the past few days, but some redness and desquamation continue in evidence.

June 24: Nearly the entire ventral aspect of the scrotum has become more diffusely reddened. The lesion is sharply delimited. The erythema is more marked at the periphery and there are present some adhering desquamative flakes at points near to or at the periphery.

June 25: The scrotal erythema is less diffuse. Here and there at the periphery of the lesion there are adherent, yellowish flakes, or scales, on an erythematous background.

June 27: The scrotal lesion is less red than it was two or three days ago. Desquamation has increased. Food consumption has been consistently excellent and the weight has been well maintained.

June 30: The scrotal lesion is covered by a brownish yellow epidermal layer that is readily pulled off exposing a glistening new skin beneath. Tabs tend to adhere along the periphery.

July 4: The scrotal lesion presents the appearance of a fairly diffuse reddening affecting almost all of the scrotal surface. The erythema is fairly sharply outlined, but the limits are not clearly perceptible caudally and at the sides on account of the fur.

July 5: The scrotum is reddened, dry, and rough. There is some scaling especially about the margins of the reddened area.

July 8: The scrotum is desquamating in flakes.

July 11: The scrotum is practically normal again.

July 13: The scrotum presents an erythematous mottling.

July 14: Area of scrotal erythema is more extensive.

July 17: The caudal half of the scrotum is erythematous, but the central portion of the affected area presents a yellowish appearance which is found to be due to an epidermal layer that peels off. Presumably this is an exfoliation following an antecedent erythema. Beneath this exfoliating membrane the skin is pale and glistening. Thus the erythema forms a roughly encircling mottled band about the central exfoliating area.

July 19: The irregular ring-like erythematous band is more red. Anteriorly it presents several eroded patches.

July 20: The entire caudal half of the scrotum is diffusely reddened. There are several large yellowish epidermal flakes attached along the anterior margin of the lesion. The erosions noted yesterday are dry and covered with yellowish crusts. Continues to eat well; weight continues to be well maintained.

July 21: Scrotal erythema less marked; desquamation continues.

July 22: Scrotum seems again of about the normal color but large, dry, yellowish flakes still adhere along the periphery.

July 26: Scrotum continues to desquamate and presents freshly reddened patches at about its center. Food consumption continues excellent. Weighs 12.2 kilograms.

July 27: The scrotal skin is a mottled red. There is only a little desquamation and that at the periphery of the lesion.

July 29: The patchy erythema of the scrotum has become more pronounced.

August 1: The scrotum again is desquamating in large flakes but redness has markedly lessened. Opposite each canine tooth the mucosa of the upper lip presents a suspicious faintly reddened patch.

On July 27, for the first time since the beginning of the experiment, left some (about one-fifth) of the daily ration; on July 29 refused all food; on July 31 again left a small portion of the daily ration.

August 2: On each side of the upper lip there is now a row of small discrete reddened patches. The floor of the mouth is slightly injected. The scrotum is about normal. Weighs 11.8 kilograms. Temperature at 3 p. m., 39°.

August 3: Erythematous patches on the upper lip are brighter. Floor of mouth is more red. Temperature at 10 a. m., 39°; at 3 p. m., 39°.

August 5: Erythematous patches on upper lip have faded somewhat. Temperature at 9.20 a. m., 38.6°; at 3 p. m., 38.6°.

August 6: The mucosa of the upper lip again presents a row of reddened patches on each side. The floor of the mouth is about normal in appearance. Left eye presents a conjunctivitis with considerable lachrymation. Scrotum is about normal.

August 8: Except for a small reddened patch on each side of the upper lip, posteriorly, the mouth is again about normal. The left eye is still watering.

August 10: The ventral aspect of the scrotum again presents an irregular reddened patch. Mouth practically normal in appearance. Left eye is watering.

August 13: The erythema of the scrotum is well marked and has extended peripherally so that it involves all but the most anterior portion of the scrotum. The left eye is still lachrymating.

August 14: The scrotal lesion is about as noted yesterday except that scattered about within the affected area are small yellowish patches. Has eaten well since the first of the month.

August 16: Mild conjunctivitis of left eye persists. The affected scrotal skin appears dry and stiff.

August 18: Scrotal erythema is less marked.

August 19: Scrotal lesion presents a flaky desquamation.

August 20: Both eyes are watering. The scrotal lesion is desquamating. The new underlying skin thus exposed is a mottled red.

August 21: The scrotal lesion has adherent flakes at the periphery. The newly exposed skin is red and presents a number of scattered yellowish, superficially necrotic-looking patches.

August 23: Scrotal lesion is not so red; the scattered necrotic patches seem more extensive. Not eating so well; has refused some food on 5 of the past 10 days. Weight is well maintained.

August 25: Scrotum of normal color except for some crusts at the sites of superficial necrosis; still some adhering tabs along periphery of the lesion.

August 27: Eyes are less watery; scrotum is healing.

August 30: Scrotum is about normal; eyes continue to water; left some food once during past week. Weighs 12 kilograms.

September 1: On the mucosa of the upper lip there is present on each side a sharply outlined reddened band extending from the median line back to the cheeks. The width of the bands is not uniform throughout. The mucosa of the cheeks and the anterior pillars is slightly flushed. The floor of the mouth is reddened.

Has eaten all of the daily ration offered during the past five days. Eyes are still watering. A portion of the left half of the scrotum is slightly mottled red.

September 3: Mouth is not so red. The erythematous mottling of the left side of the scrotum is more pronounced and more extensive.

September 4: Mouth is again about normal in appearance. Eyes continue to water. Scrotal lesion is perhaps less bright.

September 5: The affected scrotal skin has acquired a parchment-like, smooth, yellowish brown appearance.

September 8: Eyes continue to water. Erythema of scrotum is more extensive.

September 9: The mucosa of the upper lip presents on both sides a faint but definite erythematous band. Eyes are watering and there is slight photophobia. Scrotal lesion continues as already noted.

September 10: Erythematous bands on the upper lip are quite bright and sharply outlined. They extend from the median line back to the cheeks which are slightly flushed. The mucosa of the floor of the mouth is slightly injected. The affected scrotal skin has a glazed appearance. There is a desquamation beginning over the patches recorded a few days ago as having become pigmented. Along the periphery of the lesion the erythema forms a fairly definite more deeply red encircling zone or band.

September 11: The erythematous bands on upper lip have faded to a considerable degree especially on the right side. The cheeks and floor of the mouth are about normal. Eyes and scrotal lesion not notably changed.

September 13: Mouth is about normal again. The eyes are watering. Very nearly all of the erythematous area of the scrotum has become more or less keratosed and some of its seems pigmented a brownish yellow; desquamation is pronounced. The scrotal lesion has all the well-recognized characters of a pellagrous dermatitis, including a narrow zone of a more pronounced erythema at the periphery of the lesion.

September 16: The erythema of the scrotal lesion has nearly completely faded; the desquamation of a flaky character has made considerable progress, leaving a shiny new skin.

September 19: Eyes continue watery as already repeatedly noted. Desquamation of scrotal lesion has made further advance.

September 20: During the past two weeks has with increasing frequency left some food unconsumed. Weight is 12.1 kilograms and has, thus, been well maintained.

September 22: The mucosa of the upper lip on each side presents a faint but definite, unevenly reddened band. Eyes are watery. The scrotal lesion presents some peripherally adhering tabs.

September 23: The erythematous bands on the upper lip are more definite.

September 24: The erythematous bands on the upper lip are bright and well marked. Mucosa of the cheeks is slightly flushed. The vessels of the mucosa of the floor are engorged. The margins of the tongue, on each side, just back of the tip, are reddened. The scrotal lesion still presents adherent exfoliating epidermal tabs.

September 25: The bands on the upper lip have faded to a very considerable degree. The mucosa of the cheeks is about normal. The floor of the mouth, the scrotum, and the eyes continue about as last noted.

September 27: Erythematous bands have reappeared on the upper lip. On the right side of this lip at about the angle of the mouth there is present a patch of superficial necrosis of the mucosa. On the left side there are several small necrotic patches at about the center of the erythematous band. The floor of the mouth is reddened; the cheeks and anterior pillars are flushed. The left eye is reddened and watery. During the past week some food has been left on all but one of the days. Weight is 11.9 kilograms. Temperature at 10.30 a. m., 39.1°.

September 30: The bands on the mucosa of the upper lip are wider and a deeper red. The mucosa of the cheeks presents patches of necrosis. The margins and the tip of the tongue are more red. There is slight salivation and a foul buccal odor is present. Eyes are watery. Scrotum is negative.

October 1: Food consumption has diminished further. Temperature at 2 p. m., 39.3°.

October 2: The patchy superficial necrosis of affected areas on lip, cheeks, and floor of the mouth is more pronounced. Salivation has increased. Temperature at 9.30 a. m., 39.6°.

October 3: Necrotic process affecting the mucosa of the mouth is still more marked and a pseudo membrane is forming; the lesions are perhaps less red. Has eaten very little during the past 48 hours. Temperature at 10 a. m., 40.8°.

October 4: Food consumption has diminished progressively during the past week. Ate almost nothing yesterday. Weight 10.4 kilograms. Temperature at 9.45 a. m., 40.1°.

October 5: Mouth is necrotic and foul. Lips are stained with a yellowish fluid, probably vomitus. Ate nothing in past 24 hours. Lying quietly in kennel. Temperature at 11 a. m., 36°.

October 6: Died sometime during the night.

Necropsy.—(Partial). A seemingly well-nourished animal with good layer of subcutaneous fat. Inspection of thoracic and abdominal organs shows no gross inflammatory process.

Dog 50.—Male. Acquired September 25, 1923. Served in various experiments and suffered several attacks of experimental black tongue, the latest beginning March 16, 1926. On stock diet No. 156 (Table 4) from March 15, 1927, to April 6, 1927.

April 6, 1927: In good condition, weighs 12.9 kilograms. Begins experimental diet No. 288.

April 19: Some food left well nigh daily during the first week of the test diet. Has eaten all food offered daily during past five days. Weight is 12.8 kilograms.

May 3: Food consumption has been irregular during the past week. Weight is 12.6 kilograms.

May 8: Presents a slight reddening of the mucosa of the floor of the mouth.

May 9: Mouth appears normal.

May 16: Mucosa of the floor of the mouth is probably slightly reddened.

May 17: During the past two weeks some food has been left five times. Weight is 12.5 kilograms.

May 18: The mucosa of the upper lip presents a row of erythematous patches on each side. The floor of the mouth is distinctly reddened.

May 19: Each side of the upper lip presents a well marked reddened band extended from the median line back to the cheeks, the mucosa of which is flushed. The floor of the mouth is distinctly injected. Has been leaving some food daily during the past three days. Temperature at 9 a. m., 37.6°; at 3 p. m., 37.6°.

May 20: Mouth is about as noted yesterday except that the anterior faucial pillars are injected. Temperature at 11 a. m., 39.1°

May 21: The bands on the upper lip are but little changed, if anything they are less bright. There appears to be some superficial necrosis over the central portion of the mucosa of the cheeks. Mucosa of the floor of the mouth less red. Temperature at 9.40 a. m., 38.6°.

May 22: The bands on the mucosa of the upper lip have well nigh completely faded as such, but there are present on each side within the previously affected area a row of three or four reddened patches which are particularly marked on the left side. Mucosa of the cheeks continues flushed. Temperature at 10 a. m., 39.5°.

May 23: Mouth lesions appear much as they did yesterday except that the reddened patches on the upper lip seem more marked. There is present a foul buccal odor. Ate nothing yesterday. Temperature at 10 a. m., 39.2°.

May 24: The reddened patches on the upper lip have increased in dimensions and now present small areas of superficial necrosis. Otherwise mouth lesions are unchanged. Has taken no food in 48 hours. Weight is 11.4 kilograms. Temperature at 10.45 a. m., 39°.

May 25: The reddened patches on the upper lip have coalesced to form a continuous band on each side. There is some superficial necrosis within the area of the lesion on the left side of the upper lip. The mucosa of the cheeks, of the anterior faucial pillars and of the floor of the mouth is bright red. There is some superficial necrosis of the mucosa of the cheeks. Temperature at 9.50 a. m., 38.5°.

Discontinues test diet and begins stock diet No. 156. (Table 4.)

May 28: Affected areas of mucosa of mouth less red; some necrotic patches still in evidence but apparently healing. Has eaten all food offered since the change in diet on May 25.

May 31: Except for a little residual reddening on lips and cheeks, the mouth is about normal in appearance. Continues to eat well. Weighs 12.4 kilograms. Further history not relevant.

Dog 93.—Male. Acquired November 5, 1925. Served in a previous experiment, but has never while under observation presented recognizable evidence of black tongue. On stock diet No. 156 (Table 4) from March 15 to April 6, 1927.

April 6, 1927: In good condition; weighs 14.1 kilograms. Begins test diet No. 288.

April 19: Has left some food three times since beginning this test; weighs 13.9 kilograms.

May 3: During past two weeks has left some food six times; weighs 13.1 kilograms.

May 17: Food consumption during the past two weeks has been much reduced; weighs 11.8 kilograms.

May 31: Food consumption has continued on a much reduced plane; weighs 11.3 kilograms.

June 7: Food consumption during the past week has been much improved; weighs 11.3 kilograms.

June 8: Has eaten all food offered daily during the past four days. This morning there is present a slight but suspicious injection of the musosa of the floor of the mouth.

June 9: Eating well. Floor of mouth is perhaps not so red as yesterday.

June 10: Eating well. Mouth appears normal.

June 14: Has been eating well during the past 10 days; weighs 11.9 kilograms.

June 28: Has continued to eat fairly well, although some food was left twice during the past two weeks; weighs 12.2 kilograms.

July 12: Has continued to gain in weight although there has been some decline in food consumption. Weighs 12.4 kilograms.

July 16: Floor of the mouth is slightly reddened.

July 17: Floor of the mouth is more definitely reddened. There is also some reddening of the anterior faucial pillars. Food consumption is considerably reduced.

July 18: In addition to the reddening of the floor of the mouth and of the fauces there is present an irregular, faintly red patch on each side of the upper lip opposite the canines.

July 19: There is present a faint but definitely reddened band on mucosa of the upper lip on each side. The appearance of the floor and the fauces is about as noted yesterday. There has been a doubt for several days as to the normality of the scrotum. This morning the caudal half is reddened, the erythema being particularly pronounced and sharply limited along the caudal limit of the affected area. Food consumption has become much reduced; weighs 12 kilograms.

July 20: Mouth lesions are about as they were yesterday. Central portion of the ventral aspect of the scrotum is desquamating while posteriorly the reddened area is less bright than it was yesterday. Ate nothing yesterday.

July 21: The bands on the upper lip have become brighter and the mucosa of the cheeks and anterior faucial pillars has become more red. Appearance of the floor of the mouth not notably altered. Scrotal erythema has about disappeared; desquamation continues. Not eating.

July 22: Presents a moderate spastic paraplegia this morning. Is found down in the kennel, but when raised is able to stand and walk with a stiff tiptoe sort of gait. After walking about a minute and after such handling as was needed for an examination of the mouth, etc., a convulsion developed. The convulsion was of a clonic type with marked retraction of the head. Following the convulsion, which may have lasted a minute, the animal seemed dazed and irritable. This condition rapidly subsided and the animal was able to walk back to his kennel. The convulsion was quite like that of polyneuritis. The mouth lesions seem much less red.

As a possible check on the nature of the spasticity and the convulsion, the dog is given 12 grams of an antineuritic preparation in capsules.

July 23: The spastic condition noted yesterday continues little if at all changed. On walking there is the same stiff tiptoe gait. In addition there appears to be some lameness present in the right front leg. No further convulsions have been observed or elicited.

The bands on the upper lip and the redness of the fauces are slightly more pronounced.

Again given 12 grams of the antineuritic preparation in capsules. Has refused all food during the past four days. Temperature at 9.30 a. m., 37.8°.

July 24: Found this morning drooling a bloody secretion. The affected portion of the upper lip and the buccal mucosa are covered with a thick gelatinous pseudomembrane. No evidence of spasticity or lameness. The antineuritic preparation is discontinued and a dose of a commercial dried aqueous extract of yeast (yeast vitamin powder, Harris) is administered. Has taken no food in five days. Temperature at 9.30 a. m., 38.8°.

July 25: At 9.30 a. m. found lying down, but is able to get up and seems to walk normally. Drooling of bloody saliva continues. Upper lip and cheeks are bright red with eroded, ulcerated areas but the pseudomembrane has largely cleared up. Given another dose of the yeast extract. Temperature, 36.5°—3 p. m.: Has had a copious thin brown bowel movement since this morning. Temperature, 36.6°.

July 26: Found dead this morning.

Necropsy.—Fur is soiled. Rigor mortis is marked. There is a considerable layer of subcutaneous fat.

The larynx, except for slight injection of the epiglottis, is normal. The trachea is normal.

Lungs and heart are apparently normal.

The mocosa of the upper lip is bluish-gray in color and is eroded slightly. The tongue is dark but the mucosa is intact. The mucosa of the floor of the mouth is intact.

The esophagus is normal. The stomach contains a yellowish fluid; the mucosa is normal.

The upper half of the small intestine contains some yellowish fluid; the lower half is empty. The mucosa of the small gut appears normal.

The large intestine contains a semiliquid grayish brown material. The mucosa is apparently normal. The rectum is normal.

The urinary bladder is distended; the mucosa is normal.

The spleen, liver, pancreas, and kidneys are apparently normal.

Dog 97.—Male. Acquired January 18, 1926, when about 9 weeks old. Served in a previous experiment but has presented no recognizable evidence of black tongue. On stock diet No. 156 (Table 4) from March 15, 1927, to April 6, 1927.

April 6, 1927: In good condition; weighs 10.4 kilograms. Begins test diet No. 288.

April 19: Food consumption has been uniformly excellent; weighs 10.4 kilograms.

May 3: Has continued to eat well; weighs 10.2 kilograms.

May 5: A small patch of injection is present at about the center of the floor of the mouth.

May 7: The floor of the mouth shows slightly increased injection, particularly about its center.

May 8: The floor of the mouth appears about as it did yesterday. On the mucosa of the left side of the upper lip opposite the canines there is a well-marked, reddened, roughly circular patch about 1 centimeter in diameter; at the corresponding site on the right side there is a similar but faint patch.

May 9: Each side of the upper lip now presents a reddened patch opposite the canines. On the left side there is an additional patch anterior to the canines. The floor of the mouth continues injected. Food consumption has continued excellent.

May 10: On each side of the upper lip there is now present a large reddened patch opposite the canines. Anterior to this there is a similar but smaller patch and posterior thereto there is a reddened streak which merges in a reddening of the mucosa of the cheeks. The anterior faucial pillars as well as the floor of the mouth are injected. Buccal odor is slightly foul. Left some food yesterday, the first time since beginning the test diet. Weighs 10.2 kilograms. Temperature at 10.30 a. m., 39°.

May 11: The reddened patches on the lip have increased in size and are covered with a necrotic film. The mucosa of the cheeks is likewise covered with a necrotic film. The anterior faucial pillars are more markedly reddened. The foul buccal odor is more marked. Temperature at 10 a. m., 39.8°.

May 12: The mucosa of each side of the upper lip now presents a continuous reddened band extending from the cheeks forward. This band presents irregular patches of necrotic membrane. The mucosa of the cheeks, anterior faucial pillars, and the floor of the mouth is vividly red. The mucosa of both cheeks is covered with a gelatinous membrane and the floor of the mouth presents patches of a similar gelatinous film. There is some salivation and

foul odor continues. Passed a thin brownish stool this morning. Refused all food yesterday. Temperature at 10.30 a. m., 40.2°.

May 13: Salivation (drooling) and foul buccal odor more pronounced. Inflamed condition of mouth if anything is more severe. Demeanor is notably subdued. Has taken no food in past two days. Temperature at 10.40 a. m., 40.2°; at 3 p. m., 40.5°.

As the animal seems gravely ill and likely to die within the next 40 or 72 hours and as it is desired to show it at a clinic prepared for the meeting of the American Medical Association, on May 15, treatment is this day begun with an aqueous extract of autoclaved yeast by drench in the hope that life may be sufficiently prolonged.

May 14: The animal, normally very lively, is content to stay quiet in its kennel. The mouth lesions continue necrotic. Drooling continues. Has passed a copious thin brown stool. Given some of the aqueous extract of autoclaved yeast by drench and some by stomach tube. Temperature at 9.45 a. m., 39.9°; at 3 p. m., 40.6°.

May 15: Apathetic in demeanor. Outer surface of jaw soiled with buccal secretion. The mucosa of the mouth seems generally less red and more clean, the ulcerated patches on the upper lip standing out very conspicuously. Given about 200 cubic centimeters of the aqueous extract of autoclaved yeast by tube at 9 a. m. A second portion of 200 cubic centimeters given by tube at 10.30 a. m. was vomited, together with what may have been left in the stomach of the first portion. Temperature at 9.20 a. m., 39.4°; at 3 p. m., 39.4°.

May 16: The mucosa of the upper lip and cheeks is less red and cleaner, though showing the scattered superficial ulceration. Margins of the fore part of the tongue are reddened. The tongue as a whole seems shrunken. The mucosa of the floor of the mouth continues red. The anterior faucial pillars are red but less so than a day or two ago. There is some blood-stained saliva on the lips.

Given some aqueous extract of autoclaved yeast in divided does by drench; vomited a portion. Has taken no food in the past five days. Temperature at 9.30 a. m., 40.1°; at 2.20 p. m., 39.6°.

May 17: Found dead this morning.

Necropsy.—There is a moderate layer of subcutaneous fat; about a normal amount of omental and of perirenal fat.

The dorsum of the tongue is of a dark-blue color. The margins of this organ, especially anteriorly, are ulcerated. The mucosa of the upper lip is ulcerated as observed during life. The floor of the mouth, the cheeks, fauces, and pharynx are involved in the inflammatory process. The lingual aspect of the epiglottis is reddened.

The trachea appears normal. Both pleurae contain fluid with fresh adhesions on the right side. The right upper lobe of the lung presents three or four firm, dark nodules as of hemorrhagic thrombi. Heart and pericardium are normal.

The liver, pancreas, spleen, and kidneys are normal.

The upper part of the esophagus is injected. The pyloric portion of the gastric mucosa is injected.

A tapeworm and some hookworms are present in the middle portion of the small gut. The lower half of the small gut presents submucous injection and a reddish mucus secretion over the mucosa suggesting the oozing of blood into the lumen. The upper part of the large gut appears as does the lower half of the small intestine. The mucosa of the lower part of the large gut shows longitudinal folds seemingly with submucous hemorrhages.

Urinary bladder distended.

Considering the first appearance of the mouth lesions as marking the onset, we find that in from 30 to 117 days after beginning test diet No. 288 all five dogs developed a pathological condition which was indistinguishable from that shown by the dogs in experiment 1. Thus the result of experiment 2 was essentially identical with that of the experiment performed four years previously.

In experiments 1 and 2 the test diet used was, as already stated, designed as a somewhat simplified representation of a type of diet observed in association with the occurrence of pellagra (4). We have also tested, by feeding the dog, the diet, or rather a slightly simplified replica of the diet, used by Goldberger and Wheeler in the feeding experiment in white male convicts carried out in 1915 at the Rankin prison farm of the Mississippi Penitentiary, with which they succeeded in producing pellagra in 5 of 11 volunteer human subjects (5). That test is briefly detailed in experiment 3.

EXPERIMENT 3

The methods employed in the care, feeding, and observation of the test animals were the same as in experiment 1. The composition of the test diet, No. 117, is shown in Table 5. Six dogs, numbered 9, 33, 38, 42, 47, and 48, were used as the test animals. The effect of this feeding is shown in the following for each of the test animals:

Dog 9.—Male. Acquired April 1, 1923. Suffered an attack of experimental black tongue beginning May 15, 1923. On stock diet No. 34C (Table 6) from May 28, 1923, to September 20, 1923. Weight September 18, 1923, 11.9 kilograms.

September 20, 1923: In good condition. Begins experimental diet No. 117.

September 23: Has eaten none of the test diet so far.

September 25: Ate nearly all the food offered day before yesterday; otherwise has eaten none of the test diet. Weighs 11.5 kilograms.

September 29: Has eaten an increasing amount of the diet during the past three days.

October 1: Has eaten all the food offered during the past two days. The mucosa of the floor of the mouth is injected and there are patches of redness on the mucosa of both cheeks.

The development of these suspicious signs at the end of a period of 11 days during half of which none of the test diet was eaten suggests the desirability of reconditioning this dog and then repeating the experimental test. With a view, at the same time, of accustoming this animal to the test diet the reconditioning will be attempted by supplementing diet No. 117 with some ground fresh lean beef. Accordingly, 100 grams of lean beef are stirred into the day's allowance of the cooked diet.

October 2: Ate all food offered yesterday; weighs 11 kilograms. The mucosa of the floor of the mouth is quite red. The central portion of the mucosa of each cheek is diffusely reddened. A supplement of 100 grams of fresh lean beef is offered to-day. Temperature at 10 a. m. is 38.8°.

October 5: The mucosa of the mouth is distinctly less red than a day or two ago. Eating supplemented diet well.

October 6: The mucosa of the mouth is well-nigh normal in appearance. Has been eating well. Beginning to-day the allowance of fresh beef is reduced from 100 to 50 grams as a supplement to the daily allowance of 1,000 grams of cooked food into which it is stirred.

October 23: Has been eating well; weighs 12.6 kilograms.

November 6: Daily allowance of food was reduced by about 30 per cent beginning October 25. Has been eating well. Weighs 12.4 kilograms. Daily food allowance restored to previous level, beginning yesterday. Is in good condition.

November 27: Has been eating well. In excellent condition. Discontinues the beef supplement this day but continues diet No. 117, thus beginning a third feeding period. Weighs 12.7 kilograms.

December 4: Food consumption much reduced since discontinuing the beef supplement. Weighs 12.4 kilograms.

December 7: Food consumption during past three days has continued as a reduced rate. Mucosa of the floor of the mouth is suggestively injected.

December 8: No notable change in appearance of the mouth.

December 10: Injection of mucosa of the floor of the mouth is more definite and the mucosa of the cheeks is suspiciously flushed.

December 12: No notable change in the appearance of the mouth. Has taken no food during past two days.

December 14: Appearance of the mouth is unchanged. Ate a little food yesterday.

December 16: Mouth has returned to normal.

December 17: Floor of mouth is again injected.

December 18: Injection of floor of mouth is slightly more definite. Continues to take but small amounts of food. Weighs 11.5 kilograms.

December 19: Injection of the floor of the mouth is still more definite.

December 20: The injection of the floor of the mouth is now quite pronounced.

December 21: The floor of the mouth is intensely reddened; the mucosa of both cheeks and that of the left side of the upper lip are reddened. Food consumption continues small.

December 22: Small reddened patches are now present on the mucosa of the upper lip on each side. The mucosa of the floor and of the cheeks not notably changed in appearance.

December 24: The mouth lesions are more pronounced.

December 26: The mucosa of the floor of the mouth, of the soft palate, of the anterior faucial pillars and cheeks is decidedly reddened. The mucosa of the upper lip presents a bright red patch opposite the left canine and another, less red, on the opposite side. Has been eating considerably better during the past three days. Weighs 11.4 kilograms.

December 29: Mouth lesions are more pronounced. There is now present a well-defined red band along the labio-gingival fold of the upper lip on both sides. Continues to eat moderately well.

December 31: The appearance of the lip lesion is not notably changed; the injection of the other parts of the mouth is less intense.

January 2, 1924: Mouth presents no notable change. Food taking has continued at a moderate rate. Weight continues at 11.4 kilograms.

January 4: All mouth lesions have faded somewhat.

January 5: Mouth lesions seem to have paled further.

January 6: Condition of mouth seems unchanged.

January 7: Mouth lesions seem brighter, especially those on the lip and cheeks.

January 8: Reddening of the mucosa of the cheeks and soft palate has markedly

increased. Food consumption is variable, moderate to poor. Weighs 11 kilograms.

January 9: The mouth lesions are more pronounced this morning.

January 11: The lip lesion is less marked; the other mouth lesions appear unchanged. Begins a reconditioning diet, discontinuing diet No. 117.

January 12: Slight general fading of all mouth lesions. Ate all of the food offered yesterday.

January 13: Mouth lesions have faded further. Eating all food offered.

January 15: Mouth is practically normal in appearance. Further history not relevant.

Dog 83.—Male. Acquired August 6, 1923. Served in a previous experiment and had an attack of experimental black tongue beginning August 28, 1923. On stock diet No. 34C (Table 6) from August 28 to September 20, 1923. Weight on September 18 was 13.9 kilograms.

September 20, 1923: In good condition. Begins test diet No. 117.

September 25: Food consumption has fallen off rapidly and markedly since beginning the test diet. Weighs 13.5 kilograms.

October 1: Has eaten little or nothing during the past five days. Looks dejected. Sclerotics and conjunctivæ are slightly injected. Mucosa of the floor of the mouth is moderately injected. Buccal secretion is increased and quite ropy.

The development of buccal lesions at the end of 11 days, during about one-half of which, as in the case of dog No. 9, little or none of diet No. 117 was eaten suggests the desirability of immediate reconditioning. The reconditioning will be attempted by supplementing diet No. 117 with ground fresh lean beef. Accordingly, this dog is offered 100 grams of fresh beef this day apart from the cooked food.

October 2: Has had a very dark, soft bowel evacuation since last evening. Ate only about 25 grams of the fresh beef offered yesterday. This morning appetite seems to have returned, for he eagerly takes offerings of fresh beef; two offerings of 25 grams each were quickly bolted. Weighs 11.4 kilograms.

Came walking out of kennel on three feet, not using the left hind limb; after walking about a bit began to use this limb but evidently tried to favor it.

There is an eroded, bleeding area at the inner aspect of the right knee; at the outer aspect there are some irregular patches of superficial infection. The skin about the left knee is affected much as is that about the right knee. The skin of the inner aspect of the right thigh has long streaks of redness as if along lymphatics; that of the left thigh is patchily reddened. The skin about both elbows presents irregular erythematous patches and inflamed areas about sites of superficial injection.

The mucosa of the cheeks and of the anterior faucial pillars is moderately reddened. The floor of the mouth is markedly reddened. The under surface of the tongue is affected but much less so than is the floor of the mouth.

October 3: Eating the beef but none of diet No. 117. Had two dark, semi-watery stools during the night. Appears fairly lively this morning. There is no lameness in walking, but there seems to be some stiffness in the hind limbs. The mucosa of the cheeks and floor of the mouth about as yesterday. In addition there has developed a small reddened patch on the mucosa of the upper lip in the region of the left canine teeth. The appearance of the skin of the knees, thighs, and elbows is much as it was yesterday.

October 4: Quite alert and lively this morning. Had a very small, dark, semi-liquid stool during the night. Condition of the mucosa of the mouth is about as it was yesterday. The erythematous patches noted yesterday as present at the elbows have nearly completely faded; the other skin lesions are not

appreciably altered. Continues to eat the fresh beef offered, but refuses the other food, diet No. 117. Has passed some dark, liquid stools during the day.

October 5: Is fairly lively. Some fresh beef was rubbed up with a portion of his cooked ration and offered yesterday afternoon. Has not eaten this. Seems to have an aversion to the cooked test diet. The floor of the mouth is less red. Diarrhea continues with dark, semi-solid stools. The condition of the skin about the knees has not undergone appreciable change, but that of the inner aspect of both thighs has improved very much.

October 6: The condition of the floor of the mouth is not appreciably changed, but there has developed in the course of the past 36 to 48 hours two distinct broad, bandlike patches, one on each side of the mucosa of the upper lip in the canine tooth region. Ate the supplement of 100 grams of fresh beef but not any of the cooked food. Temperature at 9.40 a. m., 38.9°.

October 7: The mucosa of the left cheek is quite definitely necrotic this morning; otherwise the mouth lesions are much as yesterday. Diarrhea continues. Ate the supplement of 150 grams of fresh beef yesterday. Temperature at 9 a. m., 39°.

October 8: The mouth leasions are distinctly improved. Diarrhea persists. Ate the 150 grams of fresh beef but none of the other food. Temperature at 9 a. m., 38.8°.

October 9: The mouth lesions are decidedly improved. Bowel evacuations are less fluid. Ate a fair amount of the cooked food during the past 24 hours for the first time in 12 days. The beef was stirred into the cooked food. Weighs 10.4 kilograms.

October 10: Mouth is well-nigh normal. Eating the cooked food with beef in it. Bowel evacuations are semisolid.

October 11: Bowel actions are now formed. The skin lesions are healing but the skin at the right knee appears freshly rubbed. Eating an increased allowance of food with beef stirred in. Beginning to-day there will be stirred into the daily allowance of 1,000 grams of the cooked food (diet No. 117) 50 grams of fresh lean beef.

October 14: Mouth seems about normal. The lesions of the skin about the knees and elbows appear to have been self-inflicted, due to scratching and biting. Continues to rub and scratch the knees and thighs, freshly irritated patches being present.

October 16: Food consumption is somewhat variable from day to day and still considerably below normal. Weighs 10.8 kilograms.

October 18: Found smeared with dark colored, pasty feces this morning. Skin of knees and elbows freshly gnawed and scratched. Seems weak and worn. Took no food yesterday. Had a convulsion during the morning and, judging by his appearance this morning, had a convulsion during the night. Given 50 grams of fresh beef apart from the cooked ration.

October 19: The condition of this dog is about the same as yesterday except that he appears somewhat livelier. Given 100 grams of fresh beef separately. Ate no food other than the meat yesterday.

October 20: Seems more lively this morning. Ate a good portion of the cooked food offered yesterday. Stirred into his food an extra 100 grams of fresh beef thus making 150 grams in all stirred in.

October 21: Patches on knees and elbows are freshly irritated. Eating better. Again an extra allowance of 100 grams of beef is stirred into the cooked ration.

October 22: The floor of the mouth is slightly injected; there is a faintly reddened patch on upper lip opposite the left upper canine. This condition of the mouth may be a residual one following the previously noted mouth lesions. Has eaten well during the past two days.

October 23: Injection of the floor of the mouth is more definite. There is a fairly definite reddening of the mucosa of the upper lip there being present an elongated patch extending forward from the region of the canines on each side. Shows a persistent twitching or jerky movement of the right front and the right hind leg, more pronounced in the latter, which causes him to lose his balance and stagger or fall toward the right. Eating well.

Suspecting that the daily allowance of beef the dog has thus far had is either inadequate or marginal it is this day increased by an extra 200 grams, thus making 250 grams in all, and it is stirred into the cooked ration. Weighs 10.9 kilograms.

October 24: Seems livelier this morning. Incoordination of movements of right fore and right hind leg is less marked. Skin lesions about knees and elbows appear to be healing. Has eaten all food offered during the past four days. A supplement of, in all, 250 grams of lean beef is again stirred into the daily allowance of 1,000 grams of the cooked food (diet No. 117).

October 25: Seems much improved in general condition. Shows some malfunction of right foreleg but this is less noticeable than yesterday. Mouth is about normal. Passed a dark colored, soft stool during the day. Eating all the beef-supplemented food.

October 27: General condition is further improved. Eating well. Fresh beef, 250 grams a day, is being included in the allowance of 1,000 grams of cooked food.

October 30: Has been eating well throughout the past 10 days. Has about returned to normal general condition. Weighs 11.7 kilograms. Passed two soft, dark colored stools to-day.

November 2: Shows new scratch marks and bites of the skin about knees and elbows. Passed a soft, dark stool. Has not been eating quite so well during the past three days.

November 5: Has eaten well during the past two days. Since this animal, though now in a much improved condition, has been slow in recovering it is thought desirable to try a little dry brewers' yeast in place of the 200 grams of extra beef with which the animal's diet has been supplemented since October 23.

November 6: Continues to eat well; weighs 11.9 kilograms. Food allowance increased 50 per cent.

November 13: Has made marked improvement. The skin condition has healed. Has made a marked gain in weight. Weighs 13.5 kilograms.

November 27: Has been eating well and has been gaining in weight. Weighs 15 kilograms. Seems in good condition. Further history not relevant.

Dog 38.—Male. One of a litter whelped in the laboratory June 26, 1923. Served in previous tests and previously had black tongue, the latest beginning about December 24, 1923. On reconditioning diets from December 27, 1923, to January 29, 1924.

January 29, 1924: In good condition; weighs 8.2 kilograms. Begins test diet No. 117.

February 5: Food consumption has been excellent throughout the week since beginning this test. Weighs 8.7 kilograms.

February 12: During the past five days food consumption though good has been at a considerably reduced rate. Weighs 8.8 kilograms.

February 14: Presents this morning, 16 days after beginning the test diet, a blotchy reddening of the floor of the mouth.

February 17: The floor of the mouth is definitely injected. A small reddened patch has appeared on the mucosa of the upper lip opposite the left canine tooth. Food consumption at a reduced rate continued. This animal presents

definite signs of the beginning of our experimental pathological condition; test diet No. 117 is discontinued and reconditioning is this day begun.

February 18: Injection of the floor of the mouth has faded slightly.

February 22: Mouth lesions have about cleared up. Further history not relevant.

Dog 42.—Male. One of a litter whelped in the laboratory June 26, 1923. Served in previous tests and has had experimental black tongue, the latest attack beginning February 14, 1924. On a reconditioning diet from February 20 to March 1, 1924.

March 11, 1924: In good condition. Weighs 10.9 kilograms. Begins test diet No. 117.

March 18: Food consumption during the past week has been excellent. Weighs 11.3 kilograms.

March 25: Food consumption continues very good but during the past five days at a somewhat reduced rate. Weighs 11.6 kilograms.

April 1: Food consumption has continued at a reduced rate. Weighs 11.5 kilograms.

April 2: The mucosa of the upper lip on each side opposite the canines is slightly mottled red. The left border of the floor of the mouth shows patches of slight injection.

April 3: The reddening noted yesterday has well nigh completely faded.

April 4: Mouth seems normal this morning.

April 7: The floor of the mouth is intensely reddened as are also the mucosa of the cheeks and labio-gingival folds of upper lip on both sides.

April 8: If anything, the mouth lesions noted yesterday are more marked this morning. Food consumption has continued at a moderate rate. Temperature at 10 a. m., 39°. Weighs 11.5 kilograms.

April 10: Mouth lesions show no signs of improvement. Continues to eat moderately well.

April 11: A few irregular patches of superficial necrosis have appeared on floor of mouth and on the mucosa of the left cheek. Temperature 2 p. m., 38.7°. Test diet is discontinued; reconditioning is begun.

April 13: Mouth lesions are fading.

April 15: Mouth very greatly improved. Weighs 12 kilograms.

April 20: Mouth is again normal in appearance. Further history not relevant.

Dog 47.—Male. Acquired August 18, 1923. Served in a number of previous tests. Has already had experimental black tongue, the latest attack beginning January 7, 1924. On reconditioning diets from January 11 to March 11, 1924.

March 11, 1924: In good condition. Weighs 11.9 kilograms. Begins test diet No. 117.

June 23: This animal after a period of about 10 days of excellent food consumption, developed a capricious and slowly diminishing appetite. Has presented in other respects no evidence of any pathological condition during the 104 days since the beginning of the test.

The experiment is this day discontinued by reason of difficulty in the procurement of sweet potatoes of proper quality for the diet.

Dog 48.—Bitch. Acquired August 20, 1923. Served in some previous tests resulting in experimental black tongue. The latest attack began about November 5, 1923. Had an attack of an infective ulcerative stomatitis beginning December 17, 1923. On a reconditioning diet from December 20, 1923, to January 29, 1924.

January 29, 1924: In good condition. Weighs 6.7 kilograms. Begins test diet No. 117.

February 16, 1924: Presents an ulcerated or eroded-looking patch of the mucosa of the right cheek near the faucial pillar.

February 19: Has been eating fairly well though at a slightly reduced rate. Weighs 6.5 kilograms.

February 20: The ulceration of the mucosa of the right cheek has about healed.

February 22: Mouth is about normal.

March 25: Food consumption has been at a somewhat diminished rate. Weighs 6 kilograms.

March 27: A small pigmented and slightly reddened ulcerated patch has appeared on the mucosa of the upper lip opposite the right interdental space. There are also a few small slightly pigmented ulcerated patches along the central portion of the mucosa of the right cheek.

March 29: The lip lesion has become somewhat more pronounced and the patches on the mucosa of the cheek have coalesced into a dark brownish pigmented band, about 0.5 inch wide extending from the right faucial pillar forward. This seems to be the infective ulcerative stomatitis again.

March 31: Mouth shows no further notable change.

April 1: Food taking is rather variable. Weighs 6 kilograms.

April 2: A small pigmented ulcerated patch has appeared on the back part of the mucosa of the left cheek. The pigmented lesion on the right cheek and that on the upper lip not notably changed.

April 8: Mouth lesions appear cleaner with a noticeable tendency for the ulcerations to heal. Food taking variable and diminished. Weighs 5.6 kilograms.

April 10: The pigmented, ulcerated patches on the lip and cheeks have about healed.

April 22: There appears to be a renewal of ulceration over the previously pigmented patches on the mucosa of the cheeks. Food consumption has been somewhat further reduced. Weighs 5.3 kilograms.

April 23: The pigmented, ulcerated patches are more marked. There is a fetid buccal odor present. Has taken no food during past two days.

April 24: The floor of the mouth seems somewhat injected. No other notable change in mouth condition.

April 29: Eating poorly; becoming anaemic and emaciated. Weighs 5.2 kilograms.

April 30: Ulcers on cheeks have healed but there remains slight pigmentation of the posterior part of the mucosa of each cheek. Floor of mouth is negative.

May 20: Has been eating moderately well, maintaining her weight, which continues at 5.2 kilograms. The mucosa of the floor of the mouth is suspiciously blotchy red, 111 days since beginning the test.

May 21: The floor of the mouth, particularly about the root of the tongue, is definitely reddened, confirming yesterday's suspicion. There are present also circumscribed erythematous patches on the mucosa of the upper lip of each side in the region of the canines.

May 22: Mouth is about as yesterday but with a new reddened circumscribed patch on the mucosa of the upper lip on left side near the angle of the mouth.

May 23: The reddened patches on the lip and the floor of the mouth have faded somewhat.

May 26: Only a residual indication of the reddened condition of the floor of the mouth is appreciable.

May 27: Mouth is about normal. Weight continues at 5.2 kilograms.

May 31: The floor of the mouth, particularly the left half, shows a streaky reddening.

June 2: Mouth again about normal.

June 10: Weight continues at 5.2 kilograms.
June 17: Weighs 5 kilograms.
June 18: The floor of the mouth and the mucosa of the cheeks and of the upper lip on both sides are suspiciously reddened.
June 19: Mouth condition is more pronounced.
June 20: The floor of the mouth, the mucosa of the cheeks, and of the upper lip are markedly injected. The reddened spots on the upper lip appear to be coalescing to form the bandlike lesion. The animal is quite emaciated and somewhat sluggish. Temperature at 9.45 a. m., 38.4°.
June 22: The reddened areas show a slight superficial necrosis especially noticeable on the floor of the mouth and posterior part of the cheeks.
June 23: The superficial necrosis of floor of the mouth and of the mucosa of the cheeks has extended with a separation of the necrotic film or membrane over parts of the affected area. There are a few necrotic patches over the reddened bandlike lesion of the upper lip. Temperature at 9.50 a. m., 38.7°.
Experiment is this day discontinued by reason of difficulties in procurement of sweet potatoes of the desired quality for the test diet. Reconditioning begins.
June 24: Eating has been very poor recently; ate almost nothing during the past four days. Weighs 4.9 kilograms.
July 3: Mouth lesions practically healed. Further history not relevant.

Within a period not to exceed 111 days, five of the six animals developed definitely recognizable evidence of a pathological condition indistinguishable from that shown by the test animals in experiments 1 and 2. The one animal (No. 47) which showed no recognizable evidence of the condition was fed the test diet during 104 days at the end of which period it was found necessary, by reason of difficulties in securing sweet potatoes of satisfactory quality, to discontinue the experiment. The possibility is therefore not excluded that this animal would also have developed the condition had the feeding been carried on for a longer period.

It may be here stated that, during the period of almost five years that the feeding study, of which the foregoing experiments form a part, has been in progress, we have induced with various modifications of the foregoing diets (8) the pathological condition detailed in the protocols above presented one or more times in each of a considerable number of dogs and have found that in all essentials, as we have learned to recognize them, the picture has always been the same. Therefore, for the sake of brevity in the presentation of the further results of that study, it will be helpful at this point to present a summary of our observations of this experimental condition.

THE EXPERIMENTAL DISEASE

After a variable period during which the animal's food consumption (appetite) may have been consistently good or may have varied irregularly, examination of the mouth reveals a more or less extensive patch, or patches, of reddening of the mucosa of the upper lip, or of the mucosa of the cheeks, or of that of the floor of the mouth, or of

all three with or without a flushing of the anterior faucial pillars and, at times, of the soft palate.

The initial reddening of the mouth is at times very fleeting. It may fade completely after a few hours or a few days, only to appear again after a variable interval. It may do this repeatedly, the attack taking on a seemingly intermittent or relapsing, and, in exceptional instances when thus sufficiently prolonged, a somewhat chronic, character.

The initial reddening of the mucosa of the upper lip varies considerably with respect to extent, site, and intensity. It may appear at first as a single patch on one or both sides, most commonly in the region of apposition to the canine teeth; or it may appear in the form of a horizontal row of two or more discrete, irregularly circular patches of various diameters, or finally it may appear as an elongated red streak or band. As the attack progresses, the lip lesion, if it did not appear as such at first, develops on both sides into a sharply delimited, vividly red band. When fully developed, this band of variable and irregular width may extend on each side from the median line in front back to the cheek in the reddened mucosa of which it merges. The flushing of the mucosa of the cheeks and of the floor of the mouth may be streaky at first, but later becomes diffuse. The red of the lip lesion and of the floor of the mouth takes on a peculiar vermilion tint that is very striking and almost, if not quite, distinctive.

The tongue is ordinarily but slightly, if at all, affected until the attack is well advanced. There then develops a reddening of a segment of variable length of the lateral margin just back of the tip or at the indentations made by the canine teeth.

Sooner or later, frequently within 24 hours after the appearance of the lip lesion or of the reddening of the mucosa of the cheeks or of the floor of the mouth, irregular patches of superficial necrosis develop here and there within the reddened areas. These necrotic patches may appear of a brownish or grayish tint. At times there forms over the affected mucosa a grayish, jellylike film or pseudomembrane, which is readily removed by wiping with a bit of absorbent cotton. The necrotic process may also affect the mucosa of the base of the tongue, the soft palate, the fauces, and the gums. It frequently affects the lingual aspect of the epiglottis, but this is ordinarily not perceptible during life. At times the margin of the tongue, especially where indented by the canine teeth, becomes affected by a severe necrotic process and may take on a dark-blue tint. Exceptionally the entire free portion of the tongue takes on this color.

As the stomatitis progresses, a fetid odor and an increase in buccal secretion develop. With the advance of the stomatitis the odor

becomes more and more foul, frequently becoming extremely disgusting. The salivation may show itself at first only as a slight excess of moisture on the lips; later there is drooling, frequently of a stringy, egg-white sort of secretion, occasionally blood stained, which may hang from the corners of the mouth.

The appearance of the stomatitis is usually preceded by a falling off in (appetite) food taking. In exceptional instances, food taking may be excellent until after the development of the stomatitis has made considerable progress. In either event, as the attack proceeds, food consumption more or less rapidly declines and soon entirely ceases. If the attack is a rapidly progressive one, or as the advanced stage is reached, the animal does not again voluntarily take food, largely doubtless because of the inflamed condition of the mouth. At this stage the animal may perhaps thrust its muzzle into water as if it desired some but may make no effort to lap any of it.

In the terminal stages of the attack, vomiting or regurgitation, especially if forced feeding is attempted, may take place. Hiccough has been observed. As the attack progresses the bowel evacuations generally become small and dry—constipated. Constipation may persist to the end. Toward the end in some cases, however, this may be succeeded by diarrhea with small, brown, liquid and, at times, bloody evacuations.

The temperature at first continues at or only slightly, if at all, above its normal level (38° to 39° C.); later the temperature rises and within 24 to 48 hours reaches a point somewhere between 40° and 41°. Having risen, as a rule it remains up until the end approaches, when almost invariably it declines rapidly and almost always continuously to the end. In exceptional instances, a day or two after its first rise the temperature may drop (intermit) for some 24 hours, only to rise again to the same or higher level than that first attained. We have come to regard the rise in temperature as a sign of the gravest prognostic import. The chance of saving the life of the animal by therapeutic interference rapidly diminishes the longer treatment is delayed after the rise in temperature has taken place.

Aside from a variety of accidental skin conditions and in one case (dog 33, experiment 3) a self-inflicted dermatitis from biting and scratching, presumably because of itching or burning sensations, we have observed in some of the cases in males an eruption on the scrotum which appears to be a part of the picture we are considering. This eruption is a sharply marginated, desquamating, or exfoliating lesion involving a variable area of the ventral aspect of the scrotum. It may or may not be preceded by a recognizable erythema. Whether preceded by an erythema or not the desquamating area is frequently seen to present a narrow erythematous limiting zone or margin. In cases in which the beginning erythema occurs, the area of skin so

affected may be found, after a day or two, to have become glazed and at times pigmented a light brownish tint. This glazed, brownish epidermal layer seems to become thickened and sooner or later begins to desquamate or to exfoliate, leaving a smooth glistening new skin. At the periphery of the lesion there is left at first a ragged fringe which gradually clears up. Its evolution, margination, peripheral erythematous zone, and course distinguish it from other scrotal lesions that we have so far observed in the dog. It occurs in some 40 or 50 per cent of attacks in the male; we have not observed the eruption on the external genitalia of the female. In its mode of development and distinguishing characters (restricted localization aside) this dermatitis is frequently strikingly like, indeed can not be distinguished from, that which occurs in pellagra in man. This eruption may precede, coincide with, or follow, the development of the stomatitis.

The demeanor of the animal in the early stages presents little or nothing to suggest that it is sick. Toward the close, however, its liveliness diminishes notably and it becomes more and more apathetic. As the animal's food intake diminishes and ceases, its weight declines. If, as is usually the case, the course of the attack is acute or rapid and the animal dies within a week or 10 days there is, on inspection, no notable emaciation; if, as is much less common, the progress of the attack is of a prolonged, intermittent, or relapsing character, emaciation may become extreme.

Lachrymation with or without notable conjunctival injection has been observed in a few cases; a slight watery nasal discharge has occurred in still fewer instances. These may have been accidental manifestations—not properly a part of the experimental condition.

Convulsions of a clonic type have occurred in a few cases; see for example dog 5 in experiment 1 and dog 93 in experiment 2. Whether these are part of the disease proper or are due to a deficiency in antineuritic—as may in some if not all instances of convulsions in our experience have been the case—is not clear. In one of our cases a marked flaccid paraplegia and in another a slight weakness in the hind limbs was observed that could hardly have been due to antineuritic deprivation.

At necropsy one finds very little of significance in addition to the lesions of the mouth observable during life. These may present a somewhat different coloring post mortem, particularly if any considerable interval has elapsed between time of death and the examination. The reddening of the mouth lesions may be much less marked and these may be covered with a greenish gray instead of a grayish or brownish film or deposit. Frequently, too, one finds the margin or the whole free portion of the tongue of a dark-blue or black color when but little, if any, of this was present during life. There may

be some injection and at times some superficial necrosis of the mucosa of the lingual aspect of the epiglottis. Quite exceptionally the laryngeal mucosa may be injected. The mucosa of the upper part of the esophagus seems at times to be involved in the inflammatory process and thus may in some cases be found considerably injected. The stomach and intestines ordinarily present nothing notable. In some instances there may be in the course of the intestinal tract areas of congestion of the mucosa with here and there submucous hemorrhages and oozing of blood into the lumen of the gut. Occasionally the rectal mucosa is found deeply injected with some patches of superficial necrosis. Punctate subserous hemorrhages at times occur along the large and the lower part of the small intestine. Occasionally the vaginal mucosa may be injected. The other organs as a rule present to the eye nothing of note.

The scrotum, if affected during life, shows the scaling and margination of the dermal lesion; but the reddening, if any were present during life, may be but little appreciable.

Clinically, the distinctive early marks of the condition are the stomatitis, particularly the bilaterally symmetrical, sharply marginated erythematous bandlike lesion of the upper lip and the vivid red injection of the floor of the mouth. In some animals, when excited and panting, the buccal mucosa is likely to be generally flushed. This should, however, cause no difficulty or confusion nor should a peculiar infective ulcerative stomatitis occasionally encountered in dogs do so. This ulcerative stomatitis (see dog No. 48, experiment No. 3) is characterized by the occurrence on almost any part of the mucosa of the mouth of one or more variable-sized ulcers which are accompanied by a brownish pigmentation. These ulcers may have about the base a small reddened zone. This lesion which is primarily an ulcer with brown pigmentation of the mucosa differs markedly from the erythema with secondary superficial ulceration of the experimental condition. The peculiar dermatitis of the scrotum may appear considerably earlier than any recognizable lesion of the mouth, but if not fully marked may be difficult to distinguish from some of the other occasionally encountered accidental dermal lesions of the scrotum. We have, therefore, never used the scrotal eruption alone as a diagnostic criterion.

In our work we have commonly used our animals repeatedly so that many have had a number of more or less marked successive attacks. So far as we are able to judge, one attack confers no appreciable increase in resistance to another, nor does it appreciably diminish the resistance to a subsequent attack provided the animal is adequately reconditioned by proper feeding for a sufficiently long period during the interval. Susceptibility to attack appears not to

be influenced, at least not to any outstanding degree, by either age or sex.

The response to proper treatment when this is not too long deferred is commonly prompt and striking. The temperature, if it has already risen, declines to normal; the redness of the mouth rapidly subsides; the necrotic areas clean up, leaving healthy, superficial ulcerations which rapidly heal; the animal begins to eat, and within a week or 10 days little may be left of the grave pathological process that may have been present when treatment was begun.

Relation to black tongue of dogs.[4]—It has already been stated above that both our consultants and ourselves found the condition experimentally induced by us indistinguishable from the disease occurring spontaneously, known to American veterinarians as black tongue.[4]

Those unfamiliar with the spontaneous disease may find the following clinical description and the postmortem findings in two dogs, taken from a paper by Wheeler, Goldberger, and Blackstock (6), of interest for comparison with the above experimental condition:

Onset is rather abrupt, with lassitude, loss of appetite, occasionally vomiting and thirst; the animal, though trying often, may be unable to take water. The mouth early gives off a characteristic offensive, nauseating odor and soon becomes sore. Salivation develops early, and the drooling saliva may become bloody.

The buccal and lingual mucosa becomes more or less extensively injected and inflamed. In some cases the congestion becomes very marked, the mucosa then presenting more or less extensive purplish red areas. The tongue, more particularly the free anterior portion, may be thus affected; the margin may be bright red. Both tongue and cheeks may become covered with a dirty, gray, shiny coating suggestive of a diphtheritic membrane * * *.

The mouth may present erosions and ulcers. Vomiting may occur and either constipation or diarrhea may be present; constipation is more often a symptom of the onset, diarrhea of the later stages. When there is diarrhea the stools may be bloody, particularly in cases with fatal termination. The temperature may at times be considerably elevated.

The disease appears to end in death in about 75 per cent of the cases, running its course in these in some four to eight days.

The American literature on the postmortem findings is extremely meager. The following notes are of two necropsies made * * * August 11, 1921. One (dog) had died 24 hours and the other 10 to 15 hours previously.

In both animals the lingual and buccal mucosa was found markedly but unevenly congested, the congestion involving the mucosa of the lips and opposing gums. There was also some congestion of the mucosa of the larynx and epiglottis.

The gastric mucosa showed a patch of moderate congestion in the region of the pylorus.

In one of the dogs there was marked congestion of the mucosa of the large gut throughout its whole length, including the rectum; in the other no gross change in this part of the bowel was apparent.

The contents of the gastro-intestinal tract was small in amount; in one it was seemingly of a mucus nature, in the other more watery. In both it was yellow-

[4] Synonyms: Stuttgart dog epizootic; typhus der Hunde (dog typhoid); typhus of dogs; gastroenteritis hemorrhagica; southern canine plague; sore mouth of dogs.

tinged, probably from the medication administered just before death. This yellow tinting was also observed to affect the lingual mucosa and the buccal secretion.

Examination of the lungs, heart, liver, spleen, and kidneys disclosed no gross lesions.

Of interest in this connection, too, is the following from a case report by Goldberger, Tanner, and Saye (7):

On examining the sick animal (fifth day of sickness) we found that the conjunctivæ, especially the conjunctiva of the right eye, were much reddened, and there was some purulent secretion within the lower lid of the right eye. The owner stated that the eyes had been sore for about three weeks.

There was some drooling of ropy saliva. The lower jaw was soiled with this, and the forelegs where the jaw had rested on them were smeared with saliva and particles of garden earth.

The mucosa of the lips was found deeply inflamed with necrotic patches, especially on that of the upper lip at the site of contact with the canine teeth.

The jaws were closed and there was some resistance to our attempt to open them.

The buccal mucosa was found violently inflamed, and the tip and adjacent margins of the tongue were red. A very disagreeable odor was present.

Seen the next day the animal was

* * * unconscious and evidently dying. The condition of the mucosa of the lips and cheeks was as already noted. In addition it could be seen that the tongue presented a dark bluish patch on the left margin, one on the right margin, and a third on the under surface.

The floor of the mouth, which could not be inspected satisfactorily at our first visit, was now found to be severely inflamed. There was evidence that the animal had had a blood-streaked semiliquid bowel evacuation.

About three hours after death

* * * rigor mortis is quite well marked.

Conjunctiva of right eye is pale. The left eye shows more marked inflammation than during life. Yesterday the right eye was the more severely inflamed. Some purulent exudate in the conjunctivæ.

The mucosa of the upper lip and of the labio-gingival fold is severely inflamed, with irregular, superficial, necrotic-appearing patches. This inflammation extends down on the gums, and the affected area is limited by a rather sharp line of hyperemia slightly, but at a varying distance, above the gum margin, being farther removed at the canines than at the molars.

The mucosa of the lower lip is involved in a similar process. No hyperemic limiting line is appreciable, however, although the inflammation does not seem to extend quite to the gum edge.

The buccal mucosa presents an inflamed and superficial necrotic process quite like that of the lips. The mucosa of the soft palate presents a quite similar inflammatory and superficial necrotic process as that of the lips and cheeks.

The mucosa of the dorsum of the tongue is grayish white in appearance, except over about the anterior third, where it is reddened, the redness being uneven, patchy. The redness is particularly marked along the margins of the tip and anterior third of the tongue. On the right side the redness extends back for about two-thirds of the length of the tongue, involving more particularly the under aspect of this margin. On the inflamed reddened portion of the left margin of the tongue there are some indentations or erosions with a grayish surface. This

part of the margin presents two slightly separated segments, each about 3 or 4 millimeters in length, which are especially deeply inflamed and darkened in color. The right margin of the anterior portion of the tongue presents, like the left, a deeply inflamed hyperemic appearance, with a necrotic patch a little back of the tip.

The mucosa of the under surface of the tongue presents some superficial erosions or ulcers, three on the right side and two on the left. The eroded or ulcerated patches on the under surface of the tongue measure about ½ by 1 or 2½ centimeters. The mucosa of the floor of the mouth presents much the same inflamed appearance as does the buccal mucosa, except that the superficial necrotic process does not seem quite so severe. On each side of the frenum of the tongue there is a conspicuous oval fold of mucosa which is involved in the inflammatory necrotic process; each fold measures about ½ by 1½ centimeters.

The mucosa of the tonsils shows a marbled hyperemic appearance.

The mucosa of the pharyngeal aspect of the epiglottis is deeply congested. The mucosa of the fold extending from the base of the tongue to the epiglottis on the right side presents two superficial ulcerations. The mucosa of the epiglottis, tracheal as well as pharyngeal aspect, is deeply congested.

The trachea appears normal.

The middle lobe of right lung shows some irregular patches of consolidation and, possibly, edema. The left lung appears approximately normal.

Corresponding to the interventricular septum anteriorly there are a few punctate subpericardial hemorrhagic spots. The heart muscle and endocardium appear normal.

The liver appears normal. Adhesions (old) are present between the spleen and the omentum at the inner end of the spleen, at and near which there are present some extravasations along the line of some of the blood vessels of the omentum.

On the under surface of the omentum there are scattered dark points which, on close examination, appear to be minute varicosities of the minute omental vessels.

There is some adhesion of the capsule of the kidneys, a little of the cortex tearing away when the capsule is stripped.

The vaginal mucosa shows an inflammatory process with a superficial necrosis.

The esophagus presents irregular elongate patches of congestion, possibly representing effused blood. In the region of the pylorus of the stomach there is an area of reddened mucosa, within which area there are small patches of more intense congestion and perhaps effusion.

The duodenum presents three considerable patches of what seem to be submucous extravasations. Beside these there are other irregular smaller patches of practically the same character. In addition to the patches of seemingly submucous extravasation in the duodenum, several similar smaller patches are present scattered through the remainder of the small intestine, the jejunum and ileum.

In approximately the upper half of the large intestine the mucosa presents longitudinal reddened streaks, possibly representing submucous extravasations.

The mucosa of the lowermost portion of the rectum, close to the anus, shows marked congestion.

The stomach contained a yellowish flocculent fluid—probably food (milk and eggs). The large gut held a small amount of soft, deep brown fecal matter. One hookworm was found in the region of middle of the jejunum.

The resemblance of the spontaneous to the experimental condition is unmistakable. There are some differences, but with one exception they relate to minor details with respect to which the experimental

disease, as might be expected, affords more definite and fuller information.

The single important exception has to do with the presence of an eruption on the scrotum in some cases of the experimental disease. Such an eruption seems never to have been recorded as occurring in black tongue. Since the eruption by reason of its site may easily be overlooked, we are not inclined to attach any importance to this apparent difference between the two conditions. Indeed, we believe it highly probable that, if sought for, the scrotal dermatitis will be found to occur in the spontaneous disease much as we have observed it in the experimental condition.

Reference should here perhaps also be made to another point of apparent difference, namely, to the commonly held belief, at least up to a few years ago, that black tongue is due to an infection. This view seems to be based mainly on the occasional occurrence of the disease as an epizootic and, in a measure, on the observation that at times after the occurrence of one case in a kennel some, perhaps all, of the other dogs would also be affected. On the other hand, it has quite frequently been observed that the introduction of a case into a kennel is without result so far as the other dogs are concerned and, furthermore, experimental attempts at transmission from sick to well dogs have, with one or two doubtful exceptions, failed (6). The available evidence bearing on the etiology of the spontaneous disease is thus not inconsistent with the possibility of a dietary origin. In this connection we may state that the possibility that our experimental condition is due to an infection was given consideration early in our work, and at our invitation Dr. T. W. Kemmerer, at that time bacteriologist at the Hygienic Laboratory, now director of the State Hygienic Laboratory, Jackson, Miss., very kindly made a culture study (aerobic and anaerobic) of the heart's blood in four cases at necropsy. He reported to us that his results were negative. As our work has progressed and no evidence of communicability of the condition among our animals has at any time appeared and, still more, as we now induce the condition at will by feeding certain diets and can arrest its progress or prevent its occurrence by simple dietary means alone, the idea of an infection as the primary cause of the experimental disease can no longer, it seems to us, be seriously entertained. There being thus no clinical (including post-mortem) or etiological difference between the spontaneous and the experimental conditions to which significance can be attached, it seems permissible to conclude that they are identical.

Relation to the Chittenden-Underhill pellegralike condition in dogs.—As was mentioned in the introductory section of this report, Chittenden and Underhill (3) reported in August, 1917, on "the experimental production in dogs of a pathological condition which closely resembles

in its symptomatology pellagra in the human subject" by feeding a diet of boiled peas, cracker meal, and cottonseed oil. This report appears to be an elaboration of the observation mentioned by Chittenden in his book, The Nutrition of Man, which was quoted in the introductory section of the present communication. The condition produced in the dog by Chittenden and Underhill was described as follows:

> The onset of the pathological symptoms is generally very sudden. Usually the first abnormal manifestation is a refusal to eat, and examination will reveal nothing to account for the loss of appetite. The animal lies quietly in its pen and is apathetic. After continued refusal to eat for a day or two, the mouth of the dog will present a peculiar and characteristic appearance. The inner surface of the cheeks and lips and the edges of the tongue are so covered with pustules as to give the impression of a mass of rotten flesh. The odor from these tissues is foul and almost unbearable. When stroked with absorbent cotton the mucous lining of the mouth comes away in shreds. Intense salivation is present. The teeth appear to be solid and normal. A bloody diarrhea is present, attempts at defecation being very frequent and resulting in the passage of little more than a bloody fluid of foul odor. In some cases the thorax and upper part of the abdomen may contain many pustules half an inch in diameter which are filled with pus organisms. No other skin lesions are prominent. Death usually results without any particularly striking features.
>
> Certain dogs presented symptoms which were not common to all but undoubtedly bear a relationship to the usual manifestations. One animal apparently in the best of health was seized with a convulsion and died in a short time. Another developed the same type of convulsions but lingered for a period of a day, during which convulsions occurred at the rate of every five or six minutes. In the earlier part of this period the animal exhibited a blind, staggering gait, and would run her nose into a wall as though she could not see it. The left eye was closed and twitching, and the left legs were not under complete control, the toes being doubled up. The right side seemed normal. During the latter part of the day the dog lay in a state that appeared to be a mild, continuous spasm. A third dog showed a single convulsion as the initial symptom, and on the following day the characteristic foul mouth and bloody diarrhea were in evidence.
>
> At autopsy two types of conditions are recognizable. In the animals presenting foul mouth and bloody diarrhea the chief interest centers in the lower bowel and rectum which exhibit an intense hemorrhagic appearance. With those animals dying rapidly from convulsions the only visible abnormality of the alimentary tract is the presence in the duodenum of one or more large ulcers.

Allowing for the absence of detail in this description the resemblance to the condition experimentally induced by us and identified as black tongue can hardly fail to arrest attention. The only point of difference which may possibly be significant relates to the skin manifestations which Chittenden and Underhill describe as pustules and are thus quite unlike the pellagralike dermatitis of the scrotum observed in our animals. It is to be noted, however, that Chittenden and Underhill seem to have worked exclusively with females, on the external genitalia of which we have not observed the lesion which occurs on the scrotum of the male. This would explain the

apparent difference in the two conditions. We attach no significance to our failures, referred to in the introductory section, to reproduce the condition by feeding the Chittenden diets.

It is of interest here to note that the resemblance of the Chittenden-Underhill condition to black tongue of dogs was recognized by Carey, of Auburn, Ala., in 1920, and by Wheeler, Goldberger, and Blackstock in 1922 (6).

Considering at this time the similarity of the clinical manifestations alone, it would seem highly probable that the condition induced by us (black tongue) and that produced by Chittenden and Underhill are essentially identical.

RELATION OF EXPERIMENTAL BLACK TONGUE TO PELLAGRA

The resemblance of spontaneous black tongue to human pellagra seems to have attracted the attention of several observers (6). The first to note it appears to have been Spencer, a veterinarian of Concord, N. C., who, in 1916, stated that after studying these two maladies he was "forced to the conclusion that the so-called black tongue is canine pellagra." He gave, however, no details of his studies. Four years later Saunders, a physician of Waco, Tex., suggested that there might be some etiological connection between "sore mouth of dogs" and the human disease. In 1922, impressed by the clinical resemblance, Wheeler, Goldberger, and Blackstock (6) called attention among other things to the strikingly similar geographic distribution of the two conditions in the United States, pointing out that black tongue, like pellagra, seemed to occur principally in the Southern States.

As has already been remarked, the resemblance to pellegra of the experimental condition observed by Chittenden (1) arrested our attention over 12 years ago. This resemblance seems to have struck Chittenden and Underhill at about the same time as it did ourselves, for two years later—that is, in 1917—they published a more detailed account of Chittenden's study and specifically called attention to the resemblance of the condition in the dog to that in the human.

It must be recognized, however, that in all the foregoing the resemblance relates, in the main, simply to the occurrence in both conditions of a disturbance of the digestive tract, notably stomatitis and diarrhea. It seems to us, however, that the resemblance at all events between our experimental condition and pellagra is somewhat more detailed than this. In the first place certain of the characters of the stomatitis, namely the vivid red color, the superficial necrosis with, at times, the formation of a jellylike film or pseudomembrane, are striking features in common. A notable feature or accompaniment of the stomatitis in both conditions is salivation. The two conditions, particularly in the advanced stages,

have in common also a diarrhea which at times is bloody. A paradoxical feature of pellagra, frequently commented on, is the seemingly excellent general state of nutrition observed in many, sometimes even fatal, cases. This is quite characteristic of our experimental condition in the dog. The fever of so-called typhoid pellagra has its analogue, it would seem, in the temperature elevation in the advanced stage of black tongue. All this is striking and suggestive of the identity of the two conditions. More impressive, however, is the occurrence in experimental black tongue of an eruption that in its evolution and certain other distinctive clinical features is indistinguishable from the characteristic dermatitis of pellagra. Taken in conjunction with the other points of similarity to which reference has been made, we believe that the eruption constitutes well-nigh conclusive clinical evidence of the identity of the two conditions, black tongue and pellagra.

Important additional evidence of the identity of these two conditions is found in the suggestion of a common etiology indicated by the successful experimental production of the disease in the dog, as herein above shown, by feeding with a diet of a type found associated with the occurrence of pellagra and also with one previously actually found to be a pellagra-producing diet. Further evidence of a related character pointing to this identity, some of which has elsewhere been already briefly referred to by Goldberger, Wheeler, Lillie, and Rogers (8) will be presented in a later communication.

SUMMARY AND CONCLUSIONS

1. A pathological condition has been induced experimentally in the dog by feeding (*a*) a type of diet observed in association with pellagra and also (*b*) a diet previously found by experimental test in the human subject to be a pellagra-producing diet.

2. A description of the experimental disease summarizing observations extending over a period of nearly five years is presented.

3. The experimental condition is clinically and post mortem indistinguishable from the spontaneous disease of dogs known as black tongue or Stuttgart dog epizootic, and it is concluded that they are identical.

4. On the basis of the similarity of clinical manifestations it is considered highly probable that experimental black tongue and the Chittenden-Underhill pellagralike syndrome in dogs are identical.

5. An eruption restricted to the scrotum occurring in experimental black tongue, which in certain of its distinctive features is indistinguishable from the dermatitis of pellagra, is considered as constituting, at least in conjunction with the other points of resemblance, well-nigh conclusive *clinical* evidence of the identity of the two con-

ditions, black tongue and pellagra. Further evidence to the same effect is found in the suggestion of a common etiology indicated by the successful experimental production of the disease in the dog by feeding with pellagra-producing diets.

Acknowledgments

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TABLE 1.—*Approximate composition of diet No. 33*[1] *offered to dogs during a brief initial period of experiment 1. A slightly modified and somewhat simplified replica of a type of diet observed in association with pellagra*

(Total calories: 1,620)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Cornmeal (white, commercial, unbolted)	200	15.0	8.4	131.8
Farina (Quaker brand)	57	6.3	.8	43.5
Rice (white)	28	2.2	.1	22.1
Cowpeas (California black-eyed)	14	3.0	.2	8.5
Lard	21		21.0	
Cod-liver oil	28		28.0	
Sodium chloride	10			
Calcium carbonate	3			
Gelatine	46	42.0		
Tomato juice (canned tomatoes)	115			
Total nutrients		68.5	58.5	205.9
Nutrients per 1,000 calories		42.3	36.1	127.1

[1] The cornmeal, farina, rice, cowpeas (previously coarsely ground), lard, and sodium chloride were stirred into a suitable amount of tap water and then cooked in a double boiler of enamel ware for about an hour and a half. At the end of this period the cooking was discontinued and the remaining ingredients were well stirred in and the final weight of the mixture was brought to 2,000 grams by the addition of tap water with thorough stirring. 1 gram of the cooked ration represented approximately 0.8 calorie.

TABLE 2.—*Approximate composition of diet No. 34*[1] *offered to dogs in experiment 1*

(Total calories: 1,620)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Cornmeal (white commercial, unbolted)	200	15.0	8.4	131.8
Farina (Quaker brand)	57	6.3	.8	43.5
Rice (white)	28	2.2	.1	2.1
Cowpeas (California black-eyed)	14	3.0	.2	8.5
Lard	21		21.0	
Cod-liver oil	9.5		9.5	
Cottonseed oil	18.5		18.5	
Calcium carbonate	3.0			
Sodium chloride	10.0			
Gelatine	46.0	42.0		
Tomato juice (canned tomatoes)	115.0			
Total nutrients		68.5	58.5	205.9
Nutrients per 1,000 calories		42.3	36.1	127.1

[1] The cornmeal, farina, rice, cowpeas (previously coarsely ground), lard, and sodium chloride were stirred into a suitable amount of tap water and then cooked in a double boiler of enamel ware for about an hour and a half. At the end of this period the cooking was discontinued and the remaining ingredients were well stirred in and the final weight of the mixture was brought to 2,000 grams by the addition of tap water with thorough stirring. 1 gram of the cooked ration represented approximately 0.8 calorie.

TABLE 3.—*Approximate composition of diet No. 288*[1] *offered to dogs in experiment 2. Essentially identical with diet No. 34 (Table 2) of experiment 1. (See text.)*

(Total calories: 2,400)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Corn meal (white, laboratory sifted)[2]	300	25.2	14.1	222.0
Farina (Quaker brand)	90	9.9	1.3	68.7
Rice (white)	40	3.2	.1	31.6
Cowpeas (California black-eyed)	20	4.3	.3	12.2
Lard	23		23.0	
Cod-liver oil	14		14.0	
Cottonseed oil	20		20.0	
Calcium carbonate	4			
Sodium chloride	14			
Gelatine	66	60.3		
Tomato juice (canned tomatoes)	166			
Total nutrients		102.9	72.8	334.5
Nutrients per 1,000 calories		42.8	30.3	139.3

[1] The corn meal, farina, rice, cowpeas (previously coarsely ground) and lard were stirred into a suitable amount of tap water and then cooked in a double boiler of enamel ware for 1½ to 2 hours. At the end of this period the cooking was discontinued and the remaining ingredients were well stirred in and the final weight of the mixture was brought to 2,400 grams by the addition of tap water with thorough stirring. 1 gram of cooked ration represented approximately 1 calorie.

[2] Ground in the laboratory and sifted as in domestic practice, thus removing a small amount of bran.

TABLE 4.—*Approximate composition of diet No. 156.*[1] *Used as a stock or reconditioning diet for dogs* [2]

(Total calories: 2,400)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Wheat (commercial Graham flour)	380	47.1	8.0	279.0
Fresh beef (lean, chopped)	350	79.4	8.8	
Whole dry milk (Merrell-Soule)	60	15.5	17.5	22.5
Butterfat	21		21.0	
Cod-liver oil	9		9.0	
Brewers' yeast, dry[3]	15	6.5	.1	6.7
Sodium chloride	6			
Calcium carbonate	9			
Bone meal[4]	6			
Total nutrients		148.5	64.4	308.2
Nutrients per 1,000 calories		61.9	26.8	128.4

[1] The Graham flour, sodium chloride, and bone meal are stirred into a suitable quantity of tap water and cooked in a double boiler of enamel ware for about 1½ hours. At the end of this period the cooking was discontinued, the remaining ingredients were stirred in and the final weight was brought to 2,400 grams by the addition of tap water. 1 gram of cooked food represents approximately 1 calorie.

[2] Its adequacy is indicated by the following breeding experience: Bitch 59 whelped in the laboratory Nov. 4, 1923. On Mar. 9, 1924, at age of 4 months, began diet No. 156. Nov. 11, 1924, bred to dog 67 who was whelped in the laboratory Nov. 25, 1923, and had been on diet No. 156 since Mar. 19, 1924. On Jan. 12, 1925, bitch 59 whelped a litter of 6 pups, 2 of which were still-born and 2 of the others died within 24 hours. The remaining 2 were successfully nursed and weaned in good condition. On Oct. 1, 1925, bitch 59 again bred to dog 67 both having been continued on diet No. 156. On Dec. 9, 1925, bitch 59 whelped a litter of 7 healthy pups which were successfullly nursed and all weaned in good condition.

[3] Rich in so-called vitamin B.

[4] Commercial bone meal (chicken feed) washed in repeated quick changes of hot tap water, dried in a current of hot air, then ground to a powder to pass a 60-mesh sieve.

TABLE 5.—*Approximate composition of diet No. 117 offered to dogs in experiment 3. A somewhat simplified replica of the Rankin Prison Farm experimental diet* [1] *(5).*

(Total calories: 3,036)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Corn meal (white, commercial, unbolted)	242	18.2	10.2	159.5
Cornstarch	14			12.6
Farina (Quaker brand)	152	16.7	2.1	115.9
Rice (white)	31	2.5	.1	24.5
Cane sugar	90			90.0
Sweet potatoes (edible portion)	142	2.6	1.0	38.9
Cabbage (edible portion)	57	.9	.2	3.2
Lard	108		108.0	
Sodium chloride	10			
Total nutrients		40.9	121.6	444.6
Nutrients per 1,000 calories		13.5	40.0	146.2

[1] Computed to represent the average daily consumption per convict volunteer for the two-week period represented by the week ended Aug. 9 and that ended Aug. 29, 1915, as given in Hygienic Laboratory Bull. No. 120, p. 27.

The grits of the prison experiment diet were here replaced by an equal weight of commercial, unbolted corn meal; wheat farina was substituted for wheat flour, sugar for cane sirup, and cabbage for collards.

All of the components were stirred into water and cooked in a double boiler of enamel ware for 1½ to 2 hours.

At the end of this period the cooking was discontinued and the final weight brought to 2,500 grams by the addition of tap water with thorough stirring. Each gram of cooked ration represented approximately 1.2 calories.

TABLE 6.—*Approximate composition of diet No. 34C* [1]. *Used in the earlier period of the study in dogs as a stock or reconditioning diet* [2] *later replaced by diet No. 156. (Table 4)*

(Total calories: 1,946)

Diet		Nutrients		
Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Cornmeal (white, commercial, unbolted)	200	15.0	8.4	131.8
Farina (Quaker brand)	57	6.3	.8	43.5
Rice (white)	28	2.2	.1	22.1
Cowpeas (California black-eyed)	14	3.0	.2	8.5
Lard	21		21.0	
Cod-liver oil	9.5		9.5	
Cottonseed oil	18.5		18.5	
Sodium chloride	10			
Skim milk powder (Merrell-Soule)	105	36.6	1.4	54.0
Lean beef	100	23.2	2.5	
Tomato juice	115			
Total nutrients		86.3	62.4	259.9
Nutrients per 1,000 calories		44.3	32.0	133.3

[1] The corn meal, farina, rice, cowpeas (previously coarsely ground), sodium chloride, and lard were stirred into tap water and cooked in a double boiler of enamel ware for about 1½ hours. At the end of this period the cooking was discontinued, the remaining ingredients were well stirred in and the final weight was brought to 2,000 grams by the addition of tap water. 1 gram of the cooked ration represented approximately 1 calorie.

[2] Its adequacy is indicated by the following experience: Bitch 27 began diet No. 34C on May 17, 1923, early in gestation. On June 26, 1923, whelped a litter of 8 pups which were successfully nursed and weaned in good condition.

PUBLIC HEALTH ENGINEERING ABSTRACTS

Purification of Swimming Baths Water—A Leeds Installation. Anon. *Surveyor*, vol. 72, No. 1865, October 21, 1927, p. 374. (Abstract by R. E. Tarbett.)

A brief article covering the purification plant for the two swimming baths at Holbeck. The combined capacity of the baths is 103,000 gallons The water is circulated through the purification plant once each six hours. It is taken from the deep end of the bath by an electrically driven pump and discharged to the chemical mixing and storage tanks, from which it passes through to 8-feet diameter "pulsometer" pressure filters operated by 172,000 gallons per square feet per hour. The water is heated and aerated before being returned to the pool, aeration being supplied by compressor.

The Water Purification Equipment of the Public Baths of St. Gall. W. Grimm. (Monats.-Bull. schweiz. Ver. Gas.-Wasserfach. 1926, No. 5, 7 pp.) In *Chemical Abstracts*, vol. 21, No. 15, August 10, 1927, p. 2519. (Abstract by J. N. Wickert.)

"The pool has a surface of 200 sq. m., a water vol. of 300 cu. m., and accommodates about 61,000 people a year. 50,000 cu. m. a year of the standard drinking water supply is required. It is kept at a temperature of 23.5°. The water is withdrawn from the deep end, passed through a rapid sand filter, chlorinated, and returned to the shallow end. The added water enters with that which has just been chlorinated. The Cl content of the purified water is 0.5 to 0.9 g. per cu. m. The capacity of the filters is 4 times the volume of the tank."

State Regulation of Bathing Places. Arthur M. Crane. *Journal American Association for Promotion of Hygiene and Public Baths*, vol. 9, 1927, pp. 30–33. (Abstract by J. L. Robertson.)

The writer notes in discussion of the American Public Health Association report of the joint committee on bathing places that it is quite within the province of duly constituted health authorities to specify a certain degree of purity of pool water and this to be enforced by the police power of the State, but the directions as to how these results may be obtained should not be in the form of an arbitrary rule or regulation subject to penalty. Further comment is made on certain items of the report.

Water Supply and Sewerage for New Australian Capital (Canberra). Anon. *Engineering News-Record*, vol. 99, No. 10, September 8, 1927, p. 386. (Abstract by C. G. Gillespie.)

Population is 5,000. Water supply is from Cotter River. Watershed, area 170 square miles, is free of contamination. Average runoff is 70 m. g. d. Water will be stored in a 380 m. g. reservoir, safe yield 7 m. g. d., 15 miles from the city. Raising the dam to 100 feet will increase storage to 1,400 m. g. Water flows by gravity to a motor-driven centrifugal pumping plant, pumping against 840-foot head to a series of three service reservoirs, capacity 1 to 3 m. g. each.

Sewage works consist of settling tanks, filters, and activated sludge unit. Experience will determine which system is best for future. Effluent runs to Western Creek, which must be protected against pollution. Treatment works are three miles away on Western Creek.

Bio-aeration Method of Sewage Treatment. H. W. Streeter. *Water Works*, vol. 66, No. 7, July, 1927, pp. 294–295. (Abstract by R. C. Beckett.)

This describes the bio-aeration method of sewage treatment at Sheffield; population, 540,000. Dry weather flow is 18,000,000 gallons; wet weather flow, 65,000,000 gallons. Of the dry weather flow approximately one-third is industrial wastes, such as that from steel mills and breweries. The plant consists of a detritus tank with a capacity of one-thirty-second of the dry weather flow, bar screens with ¾-inch slots and preliminary sedimentation basins of 15,000,000

gallons capacity. Effluent is divided, 10,000,000 gallons to bio-aeration plant, remainder to contact filters. The former consists of eight tanks which connect to Dortmund tanks, thence to final effluent.

Aeration is provided by contact with air on surface by causing sewage to flow through a series of parallel channels each 6 feet wide and 4 feet deep at a velocity of 1½ feet per second, and agitating the surface layers by overhung paddle wheels extended across the width of the channels.

The effluent is colorless and odorless, having a high relative stability and a bacterial content of about 50,000 colonies per c. c. The power consumption is estimated from 30 to 35 h. p. per million gallons. Cost of operation, 2 pence 18 shillings per million gallons, d. w. f. Cost of construction from 25,000 pounds to 30,000 pounds per million gallons, d. w. f.

The disposal of sludge is yet unsolved.

The Treatment of Sewage by Activated Sludge. Anon. *Annales d'Hygiene Publique, Industrielle et Sociale*, vol. IV, No. 12, December, 1926, p. 732. (Abstract by R. C. Beckett.)

The author, after a survey of the literature, concludes that the activated sludge process is of bacterial origin. The quantity of activated sludge must be proportioned to the consumption of the organic matter of the liquid, to the nature of these, to aeration, to the condition of the sludge, and to temperature.

It is necessary to aerate sufficiently to maintain the best bacterial flora, and to proportion the aeration to the activity of the bacteria, to the quantity of organic material to be acted on, and to the quantity of sludge in order not to pass the moment when the sludge itself is altered and commences to putrefy. The sludge should be settled well and should retain but little of the suspended solids.

Court Ruling on Erection of City Sewage Disposal Plant. Anon. *Water Works*, vol. 66, No. 7, July, 1927, p. 265. (Abstract by R. C. Beckett.)

The Texas Court of Civil Appeals in the case of Boyd et al. *v.* City of San Antonio, Texas, decided against the issuance of an injunction which would have prevented construction of sewage disposal plant on a site 2½ miles from the city limits, holding that the convenience of the public outweighed the damage done to any one individual.

It further held that evidence was insufficient to show that a nuisance would result; but if it did, the individual still had his remedy at law after the plant was in operation.

Separate Sludge Digestion. L. Siebert. Proceedings of the First Conference of Sewage Works Operators, Pennsylvania State College Bulletin No. 1, January, 1927, pp. 21–30. (Abstract by L. F. Warrick.)

The author presents an interesting historical outline of sewage treatment leading up to separate sludge digestion. This process provides for settlement of solids in one tank, with removal of scum and sludge therefrom at sufficiently frequent intervals to prevent the troublesome disturbances of septic action, to separate entirely sludge digestion tanks. Sewage settling tanks used are classed as (1) gravity, and (2) mechanical types. Most economical construction in the first case calls for a relatively small, square tank with a single hopper, the slope of which is 2 to 1, or about 63 degrees from the horizontal. The mechanical type of tank is that equipped with Dorr clarifier, link belt, or similar mechanism for positive removal of sludge. The design and operation of such equipment is briefly described.

Shortcomings of separate sludge digestion systems and some suggested remedies are summarized as follows: (1) Ineffective removal of settleable solids from septic action in settling tanks, due primarily to faulty design; (2) formation of scum

instead of sludge in the digestion tanks. Adjustment of pH to 7.3–7.6 with lime and de-watering the digestion tank are corrective measures; (3) lack of capacity for sludge digestion, which may be eliminated by de-watering facilities; (4) retarded or suspended sludge digestion, generally overcome by covering, and in some cases, by heating the tank; (5) cost of operation somewhat greater than Imhoff tanks.

Advantages are listed as follows: (1) Economy of construction cost as against the cost of Imhoff tanks, particularly where deep excavation is exceptionally expensive; (2) ability to accomplish efficient removal of settleable solids and production of a good sludge capable of easy drying; (3) flexibility in the relation of settling capacity to digestion capacity, since one may be increased without the necessity of increasing the other, which may be adequate; (4) more positive control over the operation and functioning of the separate units of the plant than in Imhoff tanks or other systems; (5) applicability of separate sludge digestion tanks as additions to Imhoff tank installations in which the sludge digestion capacity is insufficient but the settling capacity is adequate.

The Septic Tank—Its Function and Operation. Raymond O'Donnell. Proceedings of the First Conference of Sewage Works Operators, Pennsylvania State College Bulletin No. 1, January ,1927, pp. 7–9. (Abstract by L. F. Warrick.)

The author describes in a concise manner septic tank treatment of sewage under the headings of function, definitions, character of applied sewage, constructional features, operation, scum, and sludge. Removal of suspended matter by sedimentation and digestion of organic matter so removed constitute the functions of a septic tank. A successfully operating tank will probably remove 50 to 60 per cent of the settleable solids of separate sewage and reduce the volume of these by gasification, liquefaction, and solidification to between 50 and 70 per cent of their original volume. Oversepticization is very detrimental to oxidation on filters or contact beds, while undersepticization produces excessive amounts of sludge. In cleaning a properly functioning tank, it is well to leave some sludge as seed for future operation. A vile, odoriferous sludge can generally be improved by removing a tank from service for six weeks, which in effect is separate sludge digestion.

New Water Softening Plant for Beverly Hills, California. R. L. Derby, *Western Construction News*, vol. 2, No. 20, October 25, 1927, pp. 31–34. (Abstract by E. A. Reinke.)

Beverly Hills derives its water supply from various wells averaging 15 or 16 grains per gallon hardness and 8 or 10 p. p. m. hydrogen sulphide. Treated water will not be over 3 grains hardness, and sulphides will be practically eliminated. After experimental work on a 70,000 g. p. d. plant a 5 m. g. d. plant was designed to include: (1) aeration; (2) coagulation with lime and alum; (3) sedimentation; (4) secondary alum coagulation; (5) secondary sedimentation; (6) filtration. Chlorination is provided to be added at any point after aeration. It will probably be used after secondary sedimentation. Aeration will remove 40 to 60 per cent of the hydrogen sulphide. The aeration house is covered and closed on the east and north, the southand west being open to take advantage of trade winds. In the northeast corner is a ventilating tower 118 feet high, with a 6-foot stack provided with an oil burner at the base. At the present plant no nuisance is noted with a 60-foot stack and none is expected in the new plant. Primary coagulation tanks with motor-driven mixing paddles are followed by a Dorr clarifier with 60-minute retention period. The water then flows through secondary coagulation tanks similar to the primary tanks and then to 2 sedimentation basins with 5 hours' retention period. Split alum dosage and long retention has been found economical and permits the greatest reduction of hydrogen sulphide. Five filter units of 1. m. g. d. each are provided, and the

design allows for five additional units on the opposite side of the pipe gallery. Red brass tube underdrains of the perforated pipe type are used and provision is made for air wash. The chlorinating apparatus is housed in a separate room with outside entrance. The clear water reservoir has a capacity of 5,000,000 gallons.

The Upper San Leandro Filtration Plant of the East Bay Water Company, Oakland, California. Wilfred F. Langelier. *Western Construction News*, vol. 2, No. 19, October 10, 1927, pp. 77–83. (Abstract by E. A. Reinke.)

The Upper San Leandro filtration plant is a thoroughly modern plant of 12 m. g. d. capacity, designed to handle the supply from Upper San Leandro Reservoir. In addition to high turbidity and color at certain seasons, traces of manganese were expected in the raw water, as had been found at the neighboring San Pablo plant, where it badly coated the sand grains and impaired the efficiency of filter units.

The plant consists of nozzle aerators; 4 coagulation units, each 20 feet in diameter by 20 feet deep, with motor operated stirring mechanisms; sedimentation basins of 2,000,000 gallons capacity arranged in duplicate for series or parallel flow and for double coagulation; four 3 m. g. d. filter units, bifurcated so that half units may be washed; chlorinators for treating raw and filtered waters; a 3,000,000 gallon filtered water storage reservoir; and provision for recovery of wash water.

Unusual features of the plant include, coarse Monterey beach sand (E. S.=0.40 m. m.; U. C.=1.7) to avoid manganese incrustation; use of red brass tubing for perforated pipe underdrains; use of air wash with high rate water wash to prevent incrustation of sand grains with manganese, simplified pipe gallery well lighted and drained and with all controls at a central table from which all four filters can be run by operator; chlorinators in rooms with outside entrances, but windows to allow operator to see these from inside, and use of one-ton cylinders of chlorine. The whole plant is designed and landscaped to give a pleasing appearance.

Milk-Borne Disease in Massachusetts. George H. Bigelow and Filip C. Forsbeck. *American Journal Public Health*, vol. 17, No. 10, October, 1927, pp. 1019–1023. (Abstract by R. E. Irwin.)

"Questionnaires were sent to the 70 cities and towns of 10,000 population and over, and replies were received from 44. The population of the towns from which we received information is 70.2 per cent of the total population of the state."

In 11 tables the data for the past three years are tabulated with comparative figures from the previous reports, when these are available.

The information given in the tables as well as the summary and conclusions are worthy of careful study by those interested in statistics relating to milk-borne diseases, dairy inspections, and milk consumption. The authors emphasize the fact that "it should be stressed that the vulnerability of a milk supply is more accurately estimated by the number of outbreaks for which it is responsible than by the total number of cases."

Some Variations of the Heat Method for Sterilizing Milking Machines. L. H. Burgwald. *Journal Agriculture Research*, Washington, 1927, vol. 34, 27–33. Abstract by W. G. Savage in the *Bulletin of Hygiene*, vol. 2, No. 9, September, 1927, p. 730.

"Earlier workers found that heat sterilization methods gave excellent bacteriological results, but were destructive to certain of the rubber parts. The author carried out a further series of tests, judging the efficiency of the sterilization by the bacterial content of the milk obtained after the use of the milking machines. Very low counts were obtained when the units of the machine were heated in water at a temperature of 160° to 167° F. for 20 to 35 minutes, and then either

removed to a refrigerator or placed in a weak chlorine solution (about 1:20,000) between milkings. The life of the rubber parts was materially longer than when the units were allowed to remain in the hot water between milkings. A cold place (below 50° F.), if protected from contamination, gave nearly as good results as placing in a refrigerator. A lower temperature for the hot water, i. e., 145° to 150° F. gave longer life for the rubber parts, but the bacterial counts were not nearly as low as when the higher temperature was adopted. Any form of heat sterilization, however, shortened the life of the rubber parts more than salt or chlorine methods. The teatcup linings always perished first."

Various Antimalaria Organizations in Italy. B. Gosio., Provveditorato Generale Dello Stato Libreria, Rome. 1925. 180 pages. (Abstract by M. A. Barber.)

A description of malaria prevention activities now in operation in Italy. The scope of the work is indicated by the following topics:

Training school for malaria workers. A short and intensive course in the practical application of antimalaria measures is provided for those who are to give all or a part of their time to such work. The length of the course varies with the class of persons to be instructed: For physicians a few conferences and demonstrations may suffice; for less instructed persons, a period of 10 or 15 days.

Instruction of school children in malaria prevention. The work includes not only instruction in hygiene, but the practical application of hygienic measures—the establishment, in schools, of baths, heliotherapy, and other means for the cure of disease and preservation of health.

Ambulatory service, in which a personnel skilled in malaria work may move from place to place, instructing the people, curing the sick, and eliminating carriers. Sometimes units are provided only with a pack horse or horse and cart. A unit may be mobile, visiting sparsely populated districts or following migratory laborers; in localities more densely populated, units may remain for long periods of time. Diseases other than malaria may receive attention.

Colonies where malaria-infected children are assembled for treatment. Ordinary as well as hygienic instruction is provided for.

A warehouse where supplies of all sorts needed in malaria work are kept in stock.

Malaria research. In the chapters devoted to this topic Professor Gosio and Dr. A. Missiroli give many interesting details regarding malaria-control measures. They describe in full methods of studying the habits of the larvae and adults of mosquitoes and give a list of the aquatic plants which favor or discourage the development of larvae. No species of *Chara* was found which hinders the growth of anopheline larvae in that climate, at least during the season when they were studied. On the other hand, duckweed (*Lemna*), the action of which is only mechanical, asphyxiating larvae, has proved a useful measure in some localities, as in the valley of the Po. Among larvicides, Paris green has proved to be successful. Methods of drainage and types of drainage tile are described fully. *Gambusia*, introduced into Italy, has thrived there and become a useful ally in mosquito destruction. The apparatus and chemicals suited for killing mosquitoes in houses and stables are illustrated and described Domestic animals may prove useful in attracting Anopheles to stables where they may be captured or destroyed.

The book is well illustrated and not only describes the scope of antimalaria organizations in Italy, but also serves as a useful handbook for malaria workers.

Studies on Brazilian Mosquitoes. II. Chagasia fajardoi. Francis Metcalf Root. *American Journal of Hygiene*, vol. 7, No. 4, July, 1927, pp. 470–480. (Abstract by M. A. Barber.)

A description, fully illustrated, of the Brazilian anopheline, *Chagasia fajardoi*. The larvae of this species are found in rapid current streams, and, as in Oriental current breeders, their grappling tail hairs have more, stronger, and more decidedly hooked branches than do those of larvae which frequent quiet waters. The adult has a *Culex*-like resting attitude.

Malaria in Haiti. C. S. Butler and E. Peterson. *United States Naval Medical Bulletin*, vol. 25, No. 2, April, 1927, pp. 278–288. (Abstract by L. L. Williams, jr.)

This brief article is a very clear picture of the high points of malaria in Haiti, and a good description of the island in relation to mosquito production. Haiti has only one efficient vector of malaria, *A. albimanus*. This anopheline is capable of transmitting all three types of malaria. The authors give their reasons for believing that malaria was imported into Haiti and is not of native origin.

The island is small, having but 10,200 square miles, less in area than the State of Maryland; yet it has various kinds of climate—from tropical on the coast to temperate in the hills. The most important plateau is a large central plain, approximately 1,200 square miles in area. Parts of the island are desert-like in their dryness; other portions are exceptionally wet. Late summer and winter are the malarial seasons. *Albimanus* breeds in all sections of the island, wherever water collects and has been found up to 2,500 feet above sea level. Rainfall varies in different parts of the island from a minimum average of 21.7 inches annually (portion of the island where the runoff dries quickly, nonmalarious) to 167 inches in the most malarial part.

Malaria is very prevalent and severe. Splenic index in a large number of school children shows rates varying from a minimum of around 2 per cent to a maximum of 100 per cent. Many schools show rates between 20 per cent and 60 per cent.

The problem of control differs in type in the rural and urban centers. It is the authors' belief that rural districts must at present depend solely upon adequate quinine treatment of those sick. Many of the cities practice mosquito control, and it is advised that the remainder of them initiate its practice.

A. albimanus quickly commences breeding in new swampy places formed by heavy rains, thus differing from our *quadrimaculatus*. The malaria infection very closely follows the rainfall, lagging behind about two months.

Control work at Port au Prince is described in a general outline. It was an extensive piece of work. *Albimanus* was breeding in many of the street ditches in seepage areas, and the nearby extensive swamps. For the ditch breeding and the seepage, the attack was drainage and fill. Rock drains (earth covered) were used extensively with success. Much of the swamp land was dried by complete clearing of brush and opening it up to process of evaporation. Some of the swamps were drained, and low portions were filled. Apparently the major portion of the work has now been completed, but there is yet some which remains to do. The tables giving malaria infection by months for a number of years show a steady decline in the case rates from a January rate (1924) of 1,350 per thousand to the January rate (1926) of only 125 per thousand.

Oiling as a Remedy for Malaria. Anon. *All India Local and Municipal Self-Govt. Gazette*, vol. 14, No. 4, March 14, 1927, pp. 71–72. (Abstract by L. L. Williams, jr.)

This is a brief article in popular style designed for education of the citizenry on how to oil, where to oil, and when to oil. Warning is given against "submerged bundles" and "drip cans." The author says "Try it and see! It is a lazy way of doing antimalaria work; it is like wanting something for nothing."

Use of the spray can is described, and the care of the pump is stressed. Good outline is given on how to train Hindu workers as oilers. Use of a fine spray is stressed. The worker is compelled to walk in the ditch and is directed to walk rapidly while spraying.

DEATHS DURING WEEK ENDED JANUARY 14, 1928

Summary of information received by telegraph from industrial insurance companies for the week ended January 14, 1928, and corresponding week of 1927. (From the Weekly Health Index, January 19, 1928, issued by the Bureau of the Census, Department of Commerce)

	Week ended Jan. 14, 1928	Corresponding week, 1927
Policies in force	69, 954, 836	66, 596, 510
Number of death claims	15, 439	13, 673
Death claims per 1,000 policies in force, annual rate	11. 5	10. 7

Deaths from all causes in certain large cities of the United States during the week ended January 14, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, January 19, 1928, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Jan. 14, 1928		Annual death rate per 1,000 corresponding week 1927	Deaths under 1 year		Infant mortality rate, week ended Jan. 14, 1928[2]
	Total deaths	Death rate[1]		Week ended Jan. 14, 1928	Corresponding week 1927	
Total (69 cities)	8, 273	14. 2	13. 8	831	811	68
Akron	37			6	3	85
Albany[3]	40	17. 4	15. 3	4	3	82
Atlanta	94	19. 3	15. 7	15	14	
White	43		9. 5	9	5	
Colored	51	(4)	30. 3	6	9	
Baltimore[3]	289	16. 9	15. 7	20	24	64
White	209		13. 6	14	18	56
Colored	80	(4)	27. 7	6	6	94
Birmingham	77	18. 1	17. 5	5	8	43
White	33		15. 3	1	3	14
Colored	44	(4)	20. 9	4	5	90
Boston	250	16. 4	14. 7	19	21	53
Bridgeport	37			8	1	147
Buffalo	141	13. 3	15. 9	17	23	73
Cambridge	29	12. 1	10. 1	2	4	86
Camden	31	12. 0	11. 4	4	3	64
Canton	23	10. 3	13. 3	3	4	71
Chicago[3]	837	13. 9	12. 3	71	82	61
Cincinnati	155	19. 6	19. 4	15	8	91
Cleveland	197	10. 2	10. 9	21	25	57
Columbus	85	14. 9	16. 8	4	14	37
Dallas	75	18. 0	12. 8	6	7	
White	55		11. 9	4	6	
Colored	20	(4)	19. 0	2	1	
Dayton	40	11. 3	11. 5	5	4	83
Denver	96	17. 1	14. 2	13	7	
Des Moines	46	15. 8	10. 9	3	1	50
Detroit	285	10. 8	12. 1	35	62	54
Duluth	33	14. 8	15. 9	2	5	47
El Paso	29	12. 9	17. 0	4	5	
Erie	35			2	0	41
Fall River[3]	32	12. 5	11. 8	6	7	103
Flint	26	9. 1	7. 7	6	3	77
Fort Worth	44	13. 7	13. 1	8	5	
White	36		12. 7	6	5	
Colored	8	(4)	16. 0	2	0	
Grand Rapids	25	8. 0	12. 6	2	5	30
Houston	86			9	4	
White	57			9	2	
Colored	29	(4)		0	2	
Indianapolis	114	15. 6	13. 7	9	6	69
White	95		13. 3	8	4	70
Colored	19	(4)	16. 3	1	2	61
Jersey City	70	11. 3	12. 5	13	14	97
Kansas City, Kans	45	19. 9	14. 6	6	5	127
White	30		16. 2	5	5	124
Colored	15	(4)	7. 4	1	0	145
Kansas City, Mo	109	14. 6	15. 4	9	5	64

Footnotes at end of table.

Deaths from all causes in certain large cities of the United States during the week ended January 14, 1928, infant mortality, annual death rate, and comparison with corresponding week of 1927. (From the Weekly Health Index, January 19, 1928, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Jan. 14, 1928		Annual death rate per 1,000 corresponding week 1927	Deaths under 1 year		Infant mortality rate, week ended Jan. 14, 1928 [3]
	Total deaths	Death rate [1]		Week ended Jan. 14, 1928	Corresponding week 1927	
Knoxville	43	21.3	11.2	6	0	130
White	41		11.6	6	0	145
Colored	2	(4)	8.5	0	0	0
Los Angeles	291			26	26	74
Lowell	21	10.0	15.6	4	5	84
Lynn	22	10.9	10.4	5	2	126
Memphis	87	25.1	21.6	3	11	35
White	46		19.9	2	10	37
Colored	41	(4)	24.7	1	1	31
Milwaukee	128	12.3	12.5	24	22	107
Minneapolis	115	13.2	10.0	11	9	66
Nashville	55	20.7	18.9	6	7	94
White	32		17.9	3	1	64
Colored	23	(4)	21.4	3	6	180
New Bedford	27	11.8	15.7	5	2	108
New Haven	50	13.9	12.1	4	1	56
New Orleans	169	20.6	18.9	11	16	53
White	124		14.8	8	8	58
Colored	45	(4)	30.7	3	8	44
New York	1,724	15.0	13.9	207	145	84
Bronx Borough	224	12.3	10.6	28	15	85
Brooklyn Borough	554	12.5	12.3	70	59	70
Manhattan Borough	741	22.1	19.1	87	54	103
Queens Borough	160	9.8	9.7	20	11	81
Richmond Borough	45	15.6	17.8	2	6	36
Newark, N. J	110	12.1	11.8	11	15	57
Oakland	70	13.4	14.0	2	8	22
Oklahoma City	49			5	4	
Omaha	60	14.1	11.7	3	7	35
Paterson	28	10.1	16.7	0	7	0
Philadelphia	534	13.5	14.7	48	42	65
Pittsburgh	204	15.9	18.5	21	29	69
Portland, Oreg	101			8	2	86
Providence	68	12.4	13.0	9	12	78
Richmond	52	14.0	14.4	11	4	144
White	32		13.4	5	3	101
Colored	20	(4)	16.9	6	1	220
Rochester	70	11.9	9.5	7	0	57
St. Louis	240	14.8	14.2	7	13	23
St. Paul	64	13.3	12.7	5	3	48
Salt Lake City [2]	30	11.4	13.1	3	5	49
San Antonio	82	19.7	18.3	9	7	
San Diego	31	13.5	22.2	1	1	19
San Francisco	154	13.8	15.3	10	6	63
Schenectady	26	14.6	9.5	4	1	125
Seattle	100	13.6	7.9	5	4	51
Somerville	24	12.2	13.9	3	2	104
Spokane	31	14.9	19.6	1	2	26
Springfield, Mass	44	15.4	12.7	5	2	79
Syracuse	45	11.8	14.0	3	4	36
Tacoma	22	10.4	13.6	4	3	102
Toledo	68	11.4	12.1	6	7	58
Trenton	37	13.9	14.1	4	1	68
Utica	34	17.1	17.1	4	4	90
Washington, D. C	162	15.3	15.9	12	13	68
White	97		13.4	6	8	50
Colored	65	(4)	23.4	6	5	111
Waterbury	22			1	1	29
Wilmington, Del	36	14.6	12.0	3	0	79
Worcester	48	12.7	13.1	4	6	49
Yonkers	28	12.1	5.3	5	2	114
Youngstown	33	9.9	8.0	8	7	107

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births. Cities left blank are not in the registration area for births.
[3] Deaths for week ended Friday, Jan. 13, 1928.
[4] In the cities for which deaths are shown by color, the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended January 22, 1927, and January 21, 1928

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 22, 1927, and January 21, 1928

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928
New England States:								
Maine	3	2	40	2	157	54	0	0
New Hampshire								
Vermont					84	4	0	0
Massachusetts	99	103	17	10	158	1,466	0	3
Rhode Island	12	19		1	2	18	0	0
Connecticut	38	27	28	2	49	139	1	0
Middle Atlantic States:								
New York	327	447	[1] 143	[1] 24	794	991	0	2
New Jersey	119	171	44	16	67	265	2	1
Pennsylvania	229	286			812	796	1	2
East North Central States:								
Ohio		112		42		321		1
Indiana	54	40	89	48	156	55	0	0
Illinois	130	202	100	46	1,718	46	4	10
Michigan	98	98		12	149	438	0	1
Wisconsin	45	31	60	99	726	140	5	4
West North Central States:								
Minnesota	27	31	2	2	222	4	3	4
Iowa [2]	28		1		405		0	
Missouri	66	[4] 52	19	[4] 8	214	[4] 61	0	[4] 3
North Dakota	6	1	11		115	8	0	1
South Dakota	4			10	107	14	0	0
Nebraska	6	10			127	5	0	3
Kansas		22	8	4	285	26	2	1
South Atlantic States:								
Delaware	5	2	2	3		37	0	0
Maryland [2]	46	29	82	60	29	345	2	1
District of Columbia	13		1		4		0	
Virginia								
West Virginia	27	16	52	27	77	71	1	0
North Carolina	34	73			174	3,418	0	0
South Carolina	21	30	1,005	1,201	32	1,347	0	0
Georgia	40		173		72		2	
Florida	53	10	5	8	25	6	0	0

[1] New York City only. [2] Week ended Friday. [4] Exclusive of Kansas City.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 22, 1927, and January 21, 1928—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928
East South Central States:								
Kentucky		9		31		135		0
Tennessee	22	21	69	137	100	647	2	1
Alabama	26	38	100	351	60	210	1	2
Mississippi	20	6					1	
West South Central States:								
Arkansas	15	11	121	169	36	206	1	0
Louisiana	19	27	28	37	104	48	1	1
Oklahoma [3]	38	44	421	266	37	147	1	1
Texas	73	60	59	73	21	35	1	0
Mountain States:								
Montana	1	4			63	4	0	5
Idaho	6				69	2	0	3
Wyoming	5	1	1		177	3	1	2
Colorado	7	13		1	51	29	0	8
New Mexico	6	8	16		17	62	0	0
Arizona	5	3	14		35	19	0	1
Utah [2]	13	8	2	2	595	1	2	3
Nevada								
Pacific States:								
Washington	19	7			224	243	2	6
Oregon	14	19	43	35	34	34	2	1
California	181	132	39	41	1,687	70	2	4

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928
New England States:								
Maine	0	0	29	40	0	0	1	4
New Hampshire								
Vermont	0	0	12	7	0	0	0	0
Massachusetts	0	3	495	383	0	3	10	5
Rhode Island	1	0	15	49	0	0	0	0
Connecticut	0	1	111	149	0	20	2	2
Middle Atlantic States:								
New York	4	4	796	689	14	9	19	22
New Jersey	0	0	310	243	2	0	8	6
Pennsylvania	1	2	561	587	0	0	19	15
East North Central States:								
Ohio		4		313		17		12
Indiana	0	1	195	97	132	120	2	3
Illinois	0	2	397	416	43	27	14	19
Michigan	0	1	272	274	34	58	3	5
Wisconsin	0	1	198	208	0	29	6	1
West North Central States:								
Minnesota	1	0	269	150	2	2	5	4
Iowa [2]	1		71		11		0	
Missouri	1	[4] 1	170	[4] 69	17	[4] 51	2	[4] 2
North Dakota	1	0	57	37	3	5	2	1
South Dakota	0	0	99	63	4	10	2	1
Nebraska	0	0	54	79	18	37	1	1
Kansas	1	0	196	179	51	74	5	1
South Atlantic States:								
Delaware [2]	0	0	37	8	0	0	0	0
Maryland [2]	0	0	81	80	0	0	6	7
District of Columbia	0		24		1		0	
Virginia								
West Virginia	0	2	58	67	10	26	29	6
North Carolina	0	0	75	80	37	175	6	2
South Carolina	2	6	15	25	10	15	4	0
Georgia	0		14		115		12	
Florida	1	0	37	9	34	7	6	5

[2] Week ended Friday. [3] Exclusive of Tulsa. [4] Exclusive of Kansas City.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 22, 1927, and January 21, 1928—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928	Week ended Jan. 22, 1927	Week ended Jan. 21, 1928
East South Central States:								
Kentucky	----	0	----	37	----	28	----	0
Tennessee	1	0	66	17	9	21	21	11
Alabama	1	1	39	22	27	8	5	7
Mississippi	0	0	20	16	13	15	1	1
West South Central States:								
Arkansas	0	0	6	9	7	14	8	3
Louisiana	0	0	19	13	15	20	7	9
Oklahoma [3]	1	0	48	37	24	142	6	18
Texas	0	0	43	56	43	23	6	4
Mountain States:								
Montana	0	1	107	39	3	32	1	1
Idaho	0	0	39	27	13	3	0	0
Wyoming	0	0	19	26	0	2	0	0
Colorado	0	0	70	127	29	23	1	2
New Mexico	0	0	28	23	0	1	2	2
Arizona	0	0	9	4	0	0	0	3
Utah [2]	0	0	29	9	5	17	0	0
Nevada	----	----	----	----	----	----	----	----
Pacific States:								
Washington	1	2	97	64	33	51	8	6
Oregon	0	10	66	18	22	46	11	5
California	2	6	280	202	62	30	14	4

[2] Week ended Friday. [3] Exclusive of Tulsa.

Report for Week Ended January 14, 1928

DISTRICT OF COLUMBIA

	Cases		Cases
Diphtheria	32	Measles	7
Influenza	2	Scarlet fever	37

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	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
November, 1927										
Kansas	2	154	15	----	216	----	12	447	139	19
December, 1927										
Georgia	1	107	524	105	224	17	1	97	24	52
Massachusetts	8	590	42	2	2,552	----	65	1,217	1	25
Nebraska	1	121	20	----	37	----	10	252	95	8
New Jersey	3	714	47	----	343	----	6	594	12	18
North Dakota	10	18	----	----	24	----	2	215	10	2
Vermont	0	9	----	----	18	----	0	46	0	0
Wisconsin	17	240	269	----	397	----	3	740	178	14
Wyoming	13	2	----	----	20	----	0	87	14	7

November, 1927

Kansas:

	Cases
Chicken pox	702
German measles	4
Lethargic encephalitis	1
Mumps	61

Kansas—Continued.

	Cases
Paratyphoid fever	3
Pink eye	1
Septic sore throat	2
Vincents angina	3
Whooping cough	222

December, 1927

	Cases
Chicken pox:	
Georgia	115
Massachusetts	1,045
Nebraska	502
New Jersey	755
North Dakota	217
Vermont	325
Wisconsin	1,424
Wyoming	56
Conjunctivitis:	
Georgia	7
Massachusetts	24
Dengue:	
Georgia	2
Dysentery:	
Georgia	23
Massachusetts	1
German measles:	
Massachusetts	61
Nebraska	7
New Jersey	55
Wisconsin	38
Hookworm disease:	
Georgia	11
Lead poisoning:	
Massachusetts	5
New Jersey	1
Lethargic encephalitis:	
Georgia	1
Massachusetts	2
Nebraska	1
North Dakota	1
Wisconsin	1
Mumps:	
Georgia	41
Massachusetts	590
Nebraska	133
Mumps—Continued.	
North Dakota	18
Vermont	76
Wisconsin	495
Wyoming	10
Ophthalmia neonatorum:	
Massachusetts	103
New Jersey	6
Paratyphoid fever:	
Georgia	3
Pink eye:	
Wyoming	1
Rabies in man:	
Georgia	2
Septic sore throat:	
Georgia	45
Massachusetts	9
Nebraska	6
Scabies:	
North Dakota	7
Tetanus:	
Georgia	2
Trachoma:	
Georgia	1
Massachusetts	1
New Jersey	1
Trichinosis:	
New Jersey	13
Typhus fever:	
Georgia	7
Whooping cough:	
Georgia	33
Massachusetts	755
Nebraska	22
New Jersey	667
North Dakota	24
Wisconsin	393
Wyoming	28

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 96 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 30,910,000. The estimated population of the 92 cities reporting deaths is more than 30,330,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended January 7, 1928, and January 8, 1927

	1928	1927	Estimated expectancy
Cases reported			
Diphtheria:			
42 States	2,084	2,302	
96 cities	1,008	1,151	1,137
Measles:			
40 States	7,362	9,195	
96 cities	3,077	2,242	
Poliomyelitis:			
42 States	60	20	
Scarlet fever:			
42 States	3,774	5,329	
96 cities	1,216	1,861	1,332
Smallpox:			
42 States	867	799	
96 cities	100	114	81
Typhoid fever:			
42 States	215	342	
96 cities	28	48	45
Deaths reported			
Influenza and pneumonia:			
92 cities	1,101	1,215	
Smallpox:			
92 cities	0	0	

City reports for week ended January 7, 1928

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence if 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 non-epidemic 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 1919 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, 1926, 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	76,400	10	1	1	0	0	1	3	3
New Hampshire:									
Concord	[1] 22,546	0	0	0	0	0	1	0	0
Manchester	84,000	0	2	0	0	1	0	2	1
Vermont:									
Barre	[1] 10,008	0	0	0	0	0	0	0	0
Burlington	[1] 24,089	2	1	2	0	0	0	1	1
Massachusetts:									
Boston	787,000	68	57	23	4	3	324	4	24
Fall River	131,000	1	5	2	1	1	0	0	1
Springfield	145,000	6	4	3	0	0	1	15	0
Worcester	193,000	17	6	4	0	0	2	77	2
Rhode Island:									
Pawtucket	71,000	4	1	2	0	0	1	0	3
Providence	275,000	0	10	12	0	2	7	5	7
Connecticut:									
Bridgeport	[2]	2	8	7	1	1	1	1	4
Hartford	164,000	9	8	10	0	0	1	0	1
New Haven	182,000	4	4	1	0	0	60	3	0
MIDDLE ATLANTIC									
New York:									
Buffalo	544,000	33	18	16	1	1	508	37	24
New York	5,924,000	144	209	275	33	9	93	23	230
Rochester	321,000	9	13	10	----	1	7	1	8
Syracuse	185,000	28	6	3	----	0	42	13	5
New Jersey:									
Camden	131,000	10	6	7	1	1	1	4	2
Newark	459,000	18	17	29	0	0	76	27	10
Trenton	134,000	0	5	0	0	0	2	0	3
Pennsylvania:									
Philadelphia	2,008,000	115	86	51	1	10	36	72	63
Pittsburgh	637,000	22	22	19	----	5	192	55	33
Reading	114,000	11	5	4	----	0	0	4	3
Scranton	143,000	18	----	14	----	----	1	0	----
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	411,000	31	13	17	0	1	146	0	15
Cleveland	960,000	51	38	52	3	0	14	108	19
Columbus	285,000	5	6	5	1	0	1	2	11
Toledo	295,000	53	12	9	0	0	85	12	10
Indiana:									
Fort Wayne	99,900	0	4	6	0	0	0	0	1
Indianapolis	367,000	18	12	7	0	1	13	47	19
South Bend	81,700	0	1	1	0	0	0	0	0
Terre Haute	71,900	0	1	0	0	0	0	0	0
Illinois:									
Chicago	3,048,000	95	102	107	14	4	21	23	96
Peoria	82,500	15	1	3	0	2	0	0	9
Springfield	64,700	4	1	3	1	1	0	10	2

[1] Estimated July 1, 1925.

[2] No estimate made.

City reports for week ended January 7, 1928—Continued

Division, State, and city	Population, July 1, 1926, 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									
Michigan:									
Detroit	1,290,000	77	74	47	9	5	167	33	33
Flint	136,000	11	8	7	0	2	6	35	4
Grand Rapids	156,000	3	5	2	0	1	34	7	1
Wisconsin:									
Kenosha	52,700	13	2	2	0	0	0	4	0
Milwaukee	517,000	60	23	13	1	1	3	20	13
Racine	69,400	2	2	0	0	0	0	1	0
Superior	[1] 39,671	0	1	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	113,000	1	3	0	0	0	0	4	0
Minneapolis	434,000	42	22	15	0	2	2	7	11
St. Paul	248,000	14	17	1	0	0	4	24	13
Iowa:									
Davenport	[1] 52,469	1	0	3	0	----	0	1	----
Des Moines	146,000	3	4	1	0	----	0	0	----
Sioux City	78,000	----	2	----	----	----	----	----	----
Waterloo	36,900	4	0	0	0	----	0	0	----
Missouri:									
Kansas City	375,000	30	10	2	1	0	4	65	15
St. Joseph	78,400	3	3	0	1	0	0	1	7
St. Louis	830,000	17	53	30	0	0	39	19	----
North Dakota:									
Fargo	[1] 26,403	18	0	0	0	0	0	2	0
Grand Forks	[1] 14,811	0	1	0	0	----	0	0	----
South Dakota:									
Aberdeen	[1] 15,036	3	0	0	0	----	0	0	----
Sioux Falls	[1] 30,127	0	1	0	0	----	2	0	----
Nebraska:									
Lincoln	62,000	26	2	3	0	0	0	18	0
Omaha	216,000	20	5	0	0	0	0	1	6
Kansas:									
Topeka	56,500	31	2	0	0	0	1	1	3
Wichita	92,500	2	4	1	0	0	0	0	6
SOUTH ATLANTIC									
Delaware:									
Wilmington	124,000	0	3	3	0	0	0	4	4
Maryland:									
Baltimore	808,000	93	41	23	18	4	153	5	44
Cumberland	[1] 33,741	0	1	1	0	0	0	0	1
Frederick	[1] 12,035	1	0	1	0	0	0	0	0
District of Columbia:									
Washington	528,000	36	20	27	2	2	3	0	21
Virginia:									
Lynchburg	30,500	16	1	3	0	0	1	0	4
Norfolk	174,000	9	3	2	0	0	4	1	4
Richmond	189,000	4	8	7	0	1	28	1	5
Roanoke	61,900	2	2	2	0	0	1	0	5
West Virginia:									
Charleston	50,700	1	1	0	0	1	0	0	3
Wheeling	[1] 56,208	22	2	1	0	0	0	0	1
North Carolina:									
Raleigh	[1] 30,371	12	0	2	0	0	2	0	1
Wilmington	37,700	0	1	1	0	0	242	0	6
Winston-Salem	71,800	3	0	1	0	0	30	10	2
South Carolina:									
Charleston	74,100	0	1	0	61	1	0	0	6
Columbia	41,800	16	0	1	0	0	166	28	1
Greenville	[1] 27,311	0	0	2	0	0	90	0	3
Georgia:									
Atlanta	(2)	----	4	----	----	----	----	----	----
Brunswick	[1] 16,809	0	0	0	0	0	1	2	0
Savannah	94,900	2	1	0	5	0	36	0	5
Florida:									
Miami	[1] 69,754	1	----	4	0	0	0	0	2
St. Petersburg	[1] 26,847	----	0	----	----	0	----	----	0
Tampa	102,000	5	1	3	0	2	2	0	4

[1] Estimated July 1, 1925. [2] No estimate made.

City reports for week ended January 7, 1928—Continued

Division, State, and city	Population, July 1, 1926, 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	58,500	1	1	1	0	1	11	0	2
Lexington	47,500	2	-------	1	0	0	2	2	3
Louisville	311,000	2	7	3	8	0	12	5	10
Tennessee:									
Memphis	177,000	6	6	9	0	1	281	8	9
Nashville	137,000	5	2	0	0	6	5	3	7
Alabama:									
Birmingham	211,000	19	4	3	15	6	4	2	17
Mobile	66,800	1	1	2	3	3	1	0	0
Montgomery	47,000	1	1	0	3	-------	0	0	-------
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	[1] 31,643	-------	1	-------	-------	-------	-------	-------	-------
Little Rock	75,900	1	1	2	0	0	35	0	1
Louisiana:									
New Orleans	419,000	0	13	11	12	14	0	0	21
Shreveport	59,500	6	2	2	0	1	9	0	4
Oklahoma:									
Oklahoma City	[2]	1	2	2	6	2	0	2	6
Tulsa	133,000	9	3	3	0	-------	1	10	-------
Texas:									
Dallas	203,000	18	10	15	0	3	0	0	6
Fort Worth	159,000	10	4	14	0	3	0	0	8
Galveston	49,100	0	1	0	0	0	0	0	1
Houston	[1] 164,954	6	6	19	0	1	0	0	7
San Antonio	205,000	1	2	11	1	1	4	0	18
MOUNTAIN									
Montana:									
Billings	[1] 17,971	0	1	0	0	0	0	0	0
Great Falls	[1] 29,883	0	1	0	0	0	0	0	2
Helena	[1] 12,037	4	0	0	0	0	0	0	0
Missoula	[1] 12,668	1	1	0	0	0	0	0	0
Idaho:									
Boise	[1] 23,042	0	0	1	0	0	1	1	0
Colorado:									
Denver	285,000	40	10	5	-------	3	4	27	15
Pueblo	43,900	24	2	1	0	0	1	0	2
New Mexico:									
Albuquerque	[1] 21,000	7	0	0	0	0	48	1	1
Utah:									
Salt Lake City	133,000	10	3	1	0	3	1	0	3
Nevada:									
Reno	[1] 12,665	1	0	0	0	0	0	0	0
PACIFIC									M
Washington:									
Seattle	[2]	18	6	4	0	-------	125	16	-------
Spokane	109,000	10	3	0	0	-------	0	0	-------
Tacoma	106,000	6	4	0	0	0	2	3	2
Oregon:									
Portland	[1] 282,383	31	11	5	0	0	4	0	5
California:									
Los Angeles	[2]	66	45	28	21	6	10	16	43
Sacramento	73,400	3	3	1	0	0	3	1	1
San Francisco	567,000	50	19	15	2	1	10	2	6

[1] Estimated July 1, 1925.

[2] No estimate made.

City reports for week ended January 7, 1928—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		
NEW ENGLAND											
Maine:											
Portland	3	1	0	0	0	0	0	0	0	1	21
New Hampshire:											
Concord	1	0	0	0	0	1	0	0	0	0	12
Manchester	2	0	0	0	0	0	0	0	0	0	15
Vermont:											
Barre	1	0	0	0	0	0	0	0	0	0	2
Burlington	1	0	0	0	0	1	0	0	0	0	9
Massachusetts:											
Boston	70	83		0	0	7	1	1	0	77	237
Fall River	3	13	0	0	0	2	0	1	0	2	31
Springfield	8	7	0	0	0	1	0	0	0	9	32
Worcester	13	5	0	0	0	3	0	0	1	9	63
Rhode Island:											
Pawtucket	1	5	0	0	0	0	0	0	0	4	------
Providence	9	27	0	0	0	3	0	1	0	3	68
Connecticut:											
Bridgeport	10	1	0	0	0	4	0	0	0	3	37
Hartford	9	6	0	0	0	0	0	0	0	0	22
New Haven	9	0	0	0	0	1	0	0	0	12	45
MIDDLE ATLANTIC											
New York:											
Buffalo	24	41	0	0	0	3	1	1	0	20	163
New York	218	227	0	0	0	118	11	4	1	172	1,574
Rochester	15	3	0	0	0	1	0	0	0	0	90
Syracuse	13	14	0	0	0	1	0	0	0	21	52
New Jersey:											
Camden	6	1	0	0	0	1	0	0	0	1	25
Newark	26	13	0	0	0	6	0	1	0	58	119
Trenton	4	4	0	0	0	1	0	0	0	4	44
Pennsylvania:											
Philadelphia	93	66	0	0	0	30	4	0	0	51	551
Pittsburgh	39	20	0	0	0	6	1	0	0	13	192
Reading	2	13	0	0	0	0	0	0	0	2	25
Scranton	------	5	------	0	------	------	------	0	------	5	------
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	19	19	0	0	0	6	1	0	0	0	128
Cleveland	43	25	1	0	0	13	2	1	0	41	154
Columbus	11	16	1	0	0	4	0	0	1	0	86
Toledo	16	11	1	0	0	7	0	1	0	4	76
Indiana:											
Fort Wayne	5	6	1	0	0	1	1	1	0	1	20
Indianapolis	10	5	10	6	0	1	0	0	0	2	110
South Bend	4	1	0	0	0	1	0	0	0	1	12
Terre Haute	3	0	1	3	0	1	0	0	0	0	19
Illinois:											
Chicago	133	93	1	0	0	45	4	0	0	107	810
Peoria	5	1	0	0	0	2	0	0	0	4	------
Springfield	2	4	0	1	0	1	0	0	0	2	24
Michigan:											
Detroit	97	99	2	0	0	22	2	1	0	50	318
Flint	9	19	1	1	0	0	0	0	0	5	15
Grand Rapids	12	11	1	0	0	3	1	1	0	2	34
Wisconsin:											
Kenosha	2	2	1	0	0	0	0	0	0	2	2
Milwaukee	28	48	2	3	0	6	0	0	1	13	125
Racine	6	6	1	0	0	0	0	0	0	4	------
Superior	3	3	1	0	0	0	0	0	0	0	8
WEST NORTH CENTRAL											
Minnesota:											
Duluth	9	4	0	0	0	1	0	0	0	0	13
Minneapolis	56	27	7	0	0	3	1	0	0	0	99
St. Paul	31	18	9	1	0	8	0	0	1	6	85

City reports for week ended January 7, 1928—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—contd.											
Iowa:											
Davenport	2	2	1	1			0	0		0	
Des Moines	7	12	1	11			0	0		0	29
Sioux City	2		1				0				
Waterloo	2	1	1	0			0	0		0	
Missouri:											
Kansas City	14	16	2	4	0	5	0	0	0	7	84
St. Joseph	2	0	0	22	0	0	0	0	0	2	27
St. Louis	43	23	2	0	0	11	2	0	0	7	231
North Dakota:											
Fargo	2	2	1	0	0	0	0	0	0	2	3
Grand Forks	1	1	0	0			0	0		0	
South Dakota:											
Aberdeen	1	0	0	0			0	0		2	
Sioux Falls	2	1	1	0			0	0		0	6
Nebraska:											
Lincoln	2	1	0	2	0	0	0	0	0	3	17
Omaha	4	7	6	1	0	4	0	0	0	0	58
Kansas:											
Topeka	5	1	0	5	0	0	0	0	0	6	15
Wichita	3	5	0	20	0	0	0	0	0	1	23
SOUTH ATLANTIC											
Delaware:											
Wilmington	6	0	0	0	0	0	0	1	0	1	45
Maryland:											
Baltimore	33	29	0	0	0	16	2	2	1	14	253
Cumberland	1	0	0	0	0	0	0	0	0	0	11
Frederick	0	0	0	0	0	0	0	0	0	0	5
District of Columbia:											
Washington	23	29	0	0	0	10	2	0	0	10	148
Virginia:											
Lynchburg	1	1	0	0	0	1	0	0	0	3	15
Norfolk	2	4	0	0	0	1	0	0	0	2	
Richmond	5	1	0	0	0	3	0	0	1	0	55
Roanoke	2	1	0	0	0	1	0	0	0	0	18
West Virginia:											
Charleston	2	4	0	0	0	3	0	1	0	0	36
Wheeling	2	2	0	0	0	0	0	1	0	0	10
North Carolina:											
Raleigh	1	1	0	0	0	0	0	0	0	0	13
Wilmington	1	0	0	0	0	0	0	0	0	0	18
Winston-Salem	3	5	2	0	0	0	0	0	0	0	10
South Carolina:											
Charleston	0	0	0	0	0	2	0	0	1	0	33
Columbia	0	1	0	0	0	0	0	0	0	0	10
Greenville	0	0	0	0	0	1	0	0	0	0	10
Georgia:											
Atlanta	4		2				0				
Brunswick	0	0	0	0	0	0	0	0	0	0	4
Savannah	1	0	0	6	0	2	0	3	0	0	46
Florida:											
Miami		0		0	0	2		1	0	0	28
St. Petersburg	0		0		0	0	0		0		15
Tampa	1	1	0	0	0	0	0	0	0	0	31
EAST SOUTH CENTRAL											
Kentucky:											
Covington	1	1	0	0	0	1	0	0	0	0	14
Lexington		0		0	0	2		0	0	0	17
Louisville	6	29	1	0	0	6	1	0	0	6	98
Tennessee:											
Memphis	6	3	1	0	0	5	1	1	0	2	54
Nashville	2	0	0	0	0	7	1	1	0	0	53
Alabama:											
Birmingham	5	2	3	1	0	5	1	1	0	0	87
Mobile	0	0	1	0	0	3	0	1	1	0	33
Montgomery	0	3	0	0			0	0		2	

City reports for week ended January 7, 1928—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 SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	----	0	----	----	----	0	----	----	----	----
Little Rock	2	1	0	0	0	0	0	0	0	0	----
Louisiana:											
New Orleans	6	4	0	0	0	25	2	0	0	2	204
Shreveport	2	2	0	0	0	1	0	0	0	2	29
Oklahoma:											
Oklahoma City	3	3	1	18	0	1	0	2	0	0	34
Tulsa	2	3	0	0	----	----	0	0	----	4	----
Texas:											
Dallas	4	7	1	1	0	2	0	0	0	3	57
Fort Worth	0	3	1	1	0	2	0	1	0	0	44
Galveston	0	0	0	0	0	1	0	0	0	0	20
Houston	2	8	2	0	0	3	0	0	0	0	53
San Antonio	1	3	0	3	0	9	0	0	0	0	90
MOUNTAIN											
Montana:											
Billings	1	1	0	0	0	0	0	0	0	0	6
Great Falls	2	2	1	0	0	0	0	0	0	0	8
Helena	1	5	0	1	0	0	0	0	0	0	3
Missoula	0	0	0	0	0	0	0	0	0	0	11
Idaho:											
Boise	2	0	0	0	0	0	0	0	0	0	11
Colorado:											
Denver	11	10	1	3	0	5	0	0	0	10	81
Pueblo	2	2	0	5	0	0	0	0	0	3	18
New Mexico:											
Albuquerque	1	6	0	0	0	9	0	0	0	0	23
Utah:											
Salt Lake City	3	2	1	3	0	3	0	1	0	0	34
Nevada:											
Reno	1	0	0	0	0	0	0	0	0	0	5
PACIFIC											
Washington:											
Seattle	11	7	3	1	----	----	1	1	----	3	----
Spokane	5	20	3	4	----	----	0	0	----	0	----
Tacoma	3	1	4	0	0	1	0	0	0	0	26
Oregon:											
Portland	7	3	7	15	0	6	1	0	0	1	72
California:											
Los Angeles	26	21	5	0	0	14	2	1	0	14	313
Sacramento	2	4	1	2	0	0	0	0	0	0	15
San Francisco	14	19	1	3	0	9	1	0	0	3	195

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
NEW ENGLAND									
Vermont:									
Burlington	0	0	0	0	0	0	0	1	0
Massachusetts:									
Boston	1	1	0	0	0	0	0	0	0
Springfield	0	0	1	0	0	0	0	0	0
Rhode Island:									
Providence	0	0	0	1	0	0	0	0	0
MIDDLE ATLANTIC									
New York:									
New York	4	3	0	3	0	0	0	4	2
Pennsylvania:									
Philadelphia	0	0	0	0	0	1	0	0	0

City reports for week ended January 7, 1928—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST NORTH CENTRAL									
Ohio:									
Cleveland	0	0	1	0	0	0	0	0	0
Indiana:									
Indianapolis	0	1	0	0	0	0	0	0	0
Illinois:									
Chicago [1]	7	1	0	0	0	0	0	0	0
Springfield	1	1	0	0	0	0	0	0	0
Michigan:									
Detroit	0	1	0	1	0	0	0	1	0
Wisconsin:									
Milwaukee	1	2	1	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Minneapolis	1	0	0	0	0	0	0	0	0
Iowa:									
Des Moines	1	----	0	----	0	----	0	0	----
SOUTH ATLANTIC [1]									
Maryland:									
Baltimore	0	0	1	1	0	0	0	0	1
West Virginia:									
Charleston	0	0	0	0	0	0	0	1	0
South Carolina:									
Charleston	0	0	0	0	1	0	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Nashville	0	0	0	0	0	1	0	0	0
Alabama:									
Birmingham	0	1	0	0	1	1	0	0	0
Montgomery	0	0	0	0	1	0	0	0	0
WEST SOUTH CENTRAL									
Arkansas:									
Little Rock	1	0	0	0	0	0	0	0	0
Louisiana:									
New Orleans	0	0	1	1	0	0	0	0	0
Shreveport	1	1	0	0	0	0	0	0	0
Oklahoma:									
Oklahoma City	0	0	0	1	0	0	0	1	0
Texas:									
Dallas	1	1	0	0	0	0	0	1	0
Galveston	0	0	0	0	0	1	0	0	0
Houston	0	1	0	0	0	0	0	0	0
MOUNTAIN									
Montana:									
Great Falls	1	1	0	0	0	0	0	0	0
Colorado:									
Denver	1	0	0	0	0	0	0	1	0
Pueblo	1	1	0	0	0	0	0	0	0
Utah:									
Salt Lake City	1	0	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	2	----	0	----	0	----	0	0	----
California:									
Los Angeles	1	0	0	0	0	0	0	1	0
Sacramento	1	0	0	0	0	0	0	2	0

[1] Rabies (human): 1 case and 1 death at Chicago, Ill., and 1 death at Richmond, Va.

The following table gives the rates per 100,000 population for 101 cities for the five-week period ended January 7, 1928, compared with those for a like period ended January 8, 1927. The population figures used in computing the rates are approximate estimates as of July 1, 1927 and 1928, respectively, authoritative figures for many of the cities not being available. The 101 cities reporting cases had estimated aggregate populations of approximately 31,050,000 in 1927 and 31,657,000 in 1928. The 95 cities reporting deaths had nearly 30,370,000 estimated population in 1927 and nearly 30,961,000 in 1928. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, December 4, 1927, to January 7, 1928—Annual rates per 100,000 population, compared with rates for the corresponding period of 1926–27[1]

DIPHTHERIA CASE RATES

	Week ended—									
	Dec. 11, 1926	Dec. 10, 1927	Dec. 18, 1926	Dec. 17, 1927	Dec. 25, 1926	Dec. 24, 1927	Jan. 1, 1927	Dec. 31, 1927	Jan. 8, 1927	Jan. 7, 1928
101 cities	201	204	188	[2] 206	[3] 163	[2] 203	176	[4] 187	198	[5] 170
New England	163	216	160	200	160	193	158	165	158	149
Middle Atlantic	161	228	167	226	140	233	171	221	182	202
East North Central	223	228	213	248	[6] 182	212	193	200	223	176
West North Central	194	129	129	129	113	123	165	[7] 129	188	[8] 100
South Atlantic	237	190	216	140	[9] 214	143	173	129	222	[10] 154
East South Central	284	71	145	[2] 162	150	[2] 177	186	[2] 147	137	[2] 109
West South Central	266	218	258	218	168	344	223	[11] 271	252	[11] 246
Mountain	246	144	164	162	137	117	137	63	126	71
Pacific	238	168	252	168	225	157	155	141	230	123

MEASLES CASE RATES

101 cities	197	225	193	[2] 249	[3] 209	[2] 288	231	[4] 325	384	[5] 520
New England	165	539	229	604	167	536	184	708	253	917
Middle Atlantic	23	199	24	206	22	251	22	331	31	466
East North Central	212	140	256	117	[6] 249	157	294	160	427	265
West North Central	129	50	109	46	77	38	61	[7] 39	259	[8] 102
South Atlantic	54	527	89	607	[9] 62	797	179	832	204	[10] 1,461
East South Central	78	367	21	[2] 737	31	[2] 1,032	78	[2] 545	106	[2] 2,196
West South Central	146	134	82	252	103	84	13	[11] 116	186	[11] 197
Mountain	3,217	36	2,351	27	2,780	18	3,545	36	5,227	62
Pacific	613	178	603	238	879	257	697	283	1,517	383

SCARLET FEVER CASE RATES

101 cities	238	184	279	[2] 212	[3] 253	[2] 187	267	[4] 210	318	[5] 206
New England	340	320	387	325	248	281	356	346	491	340
Middle Atlantic	178	156	214	199	212	173	235	200	285	196
East North Central	235	216	241	243	[6] 255	212	245	257	288	234
West North Central	432	206	413	204	371	202	385	[7] 194	449	[8] 207
South Atlantic	173	134	199	163	[9] 171	145	238	149	231	[10] 152
East South Central	150	82	248	[2] 147	243	[2] 103	176	[2] 59	233	[2] 65
West South Central	142	117	236	172	125	92	150	[11] 129	153	[11] 103
Mountain	802	306	1,112	243	975	171	893	234	950	195
Pacific	230	152	383	154	303	191	252	126	340	184

[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, 1926, 1927, and 1928, respectively.
[2] Louisville, Ky., not included.
[3] Terre Haute, Ind., and Norfolk, Va., not included.
[4] Sioux City, Iowa, Louisville, Ky., and Fort Smith, Ark., not included.
[5] Sioux City, Iowa, Fargo, N. Dak., Atlanta, Ga., Louisville, Ky., and Fort Smith, Ark., not included.
[6] Terre Haute, Ind., not included.
[7] Sioux City, Iowa, not included.
[8] Sioux City, Iowa, and Fargo, N. Dak., not included.
[9] Norfolk, Va., not included.
[10] Atlanta, Ga., not included.
[11] Fort Smith, Ark., not included.

Summary of weekly reports from cities, December 4, 1927, to January 7, 1928—Annual rates per 100,000 population, compared with rates for the corresponding period of 1926–27—Continued

SMALLPOX CASE RATES

	Week ended—									
	Dec. 11, 1926	Dec. 10, 1927	Dec. 18, 1926	Dec. 17, 1927	Dec. 25, 1926	Dec. 24, 1927	Jan. 1, 1927	Dec. 31, 1927	Jan. 8, 1927	Jan. 7, 1928
101 cities	11	13	16	[2] 19	[3] 14	[2] 16	14	[4] 15	22	[5] 17
New England	0	0	0	0	0	0	0	0	0	0
Middle Atlantic	1	0	1	0	0	0	1	0	0	0
East North Central	7	4	11	17	[6] 16	12	7	12	32	9
West North Central	38	75	46	115	28	77	40	[7] 82	57	[8] 108
South Atlantic	19	7	26	5	[9] 30	20	41	4	27	[10] 12
East South Central	21	5	78	[2] 7	36	[2] 29	47	[2] 15	41	[2] 7
West South Central	9	8	43	0	26	13	21	[11] 4	41	[11] 16
Mountain	18	99	0	117	18	99	9	144	0	106
Pacific	43	39	40	31	43	26	21	29	60	26

TYPHOID FEVER CASE RATES

101 cities	13	11	12	[2] 8	[3] 10	[2] 11	12	[4] 7	8	[5] 5
New England	2	12	31	0	40	9	24	14	9	7
Middle Atlantic	18	8	8	8	5	10	7	4	6	3
East North Central	3	9	5	3	[6] 3	8	5	5	5	3
West North Central	4	14	10	6	10	8	4	[7] 10	8	[8] 0
South Atlantic	24	9	19	9	[9] 16	16	34	13	7	[10] 15
East South Central	41	31	21	[2] 29	16	[2] 29	21	[2] 15	25	[2] 29
West South Central	13	21	21	17	17	17	17	[11] 13	25	[11] 0
Mountain	9	9	9	18	0	9	27	18	9	9
Pacific	16	13	24	16	21	10	16	0	8	5

INFLUENZA DEATH RATES

95 cities	17	12	14	[2] 14	[2] 15	[2] 17	17	[2] 19	20	[12] 19
New England	9	9	7	12	7	5	12	5	16	16
Middle Atlantic	12	7	13	9	14	11	21	14	18	13
East North Central	14	9	12	11	[6] 10	13	15	10	17	10
West North Central	15	6	15	6	11	10	8	8	14	[13] 4
South Atlantic	34	17	26	15	[9] 34	20	17	22	16	[10] 21
East South Central	41	56	5	[2] 88	36	[2] 59	26	[2] 81	48	[2] 132
West South Central	40	47	40	56	18	73	13	82	42	82
Mountain	36	9	9	9	27	27	46	72	63	53
Pacific	11	3	7	17	4	24	0	31	10	24

PNEUMONIA DEATH RATES

95 cities	129	110	137	[2] 118	[3] 137	[2] 135	164	[2] 157	195	[12] 170
New England	134	51	149	102	151	121	172	146	181	103
Middle Atlantic	140	119	147	117	166	127	180	158	208	186
East North Central	103	97	117	97	[6] 109	105	134	135	169	140
West North Central	118	100	120	91	91	98	118	108	116	[11] 126
South Atlantic	155	138	127	164	[9] 153	186	187	188	229	[10] 231
East South Central	171	148	129	[2] 162	109	[2] 243	191	[2] 221	213	[2] 273
West South Central	150	103	172	194	84	233	150	310	238	238
Mountain	109	216	273	135	164	243	201	198	368	195
Pacific	113	110	124	131	148	165	198	138	210	176

[2] Louisville, Ky., not included.
[3] Terre Haute, Ind., and Norfolk, Va., not included.
[4] Sioux City, Iowa, Louisville, Ky., and Fort Smith, Ark., not included.
[5] Sioux City, Iowa, Fargo, N. Dak., Atlanta, Ga., Louisville, Ky., and Fort Smith, Ark., not included.
[6] Terre Haute, Ind., not included.
[7] Sioux City, Iowa, not included.
[8] Sioux City, Iowa, and Fargo, N. Dak., not included.
[9] Norfolk, Va., not included.
[10] Atlanta, Ga., not included.
[11] Fort Smith, Ark., not included.
[12] Fargo, N. Dak., Atlanta, Ga., and Louisville, Ky., not included.
[13] Fargo, N. Dak., not included.

Number of cities included in summary of weekly reports, and aggregate population of cities in each group, approximated as of July 1, 1927 and 1928, respectively

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	
			1927	1928	1927	1928
Total	101	95	31,050,300	31,657,000	30,369,500	30,960,700
New England	12	12	2,242,700	2,274,400	2,242,700	2,274,400
Middle Atlantic	10	10	10,594,700	10,732,400	10,594,700	10,732,400
East North Central	16	16	7,820,700	7,991,400	7,820,700	7,991,400
West North Central	12	10	2,634,500	2,683,500	2,518,500	2,566,400
South Atlantic	21	21	2,890,700	2,981,900	2,890,700	2,981,900
East South Central	7	6	1,028,300	1,048,300	980,700	1,000,100
West South Central	8	7	1,260,700	1,307,600	1,227,800	1,274,100
Mountain	9	9	581,600	591,100	581,600	591,100
Pacific	6	4	1,996,400	2,046,400	1,512,100	1,548,900

FOREIGN AND INSULAR

PLAGUE RATS ON VESSEL

Steamship "Modemi"—At Goteborg, Sweden—From Bahia and Buenos Aires—Under date of December 29, 1927, the arrival of the steamship *Modemi* from Bahia and Buenos Aires, with a cargo of grain, was reported at Goteborg, Sweden. Dead rats were found on board, but no plague was shown to exist at time of fumigation of the vessel. On December 22, 1927, plague indications were reported found among rats. The *Modemi* left Buenos Aires November 11 and St. Vincent, Cape Verde Islands, December 1, 1927.

ARGENTINA

Communicable diseases—November, 1927.—During the month of November, 1927, communicable diseases were reported at Rosario, Argentina, as follows:

Disease	Cases	Disease	Cases
Diphtheria	3	Scarlet fever	7
Gastroenteritis	33	Tuberculosis	17
Measles	2	Typhoid fever	2
Meningitis	21	Typhus fever	1
Plague	1		

Population, estimated, 419,487.

BARBADOS (BRITISH WEST INDIES)

Further [1] *relative to outbreak of malarial fever.*—Further information, under date of December 23, 1927, relative to the outbreak of malarial fever reported at Barbados, British West Indies, shows the disease prevalent in all parts of the island, with 930 reported cases. Of this number, 296 cases were stated to have occurred in the parish of St. James. To December 20, 21 deaths from the disease were reported. The fatalities were stated to have been among the aged.

BELGIAN CONGO

Yellow fever—Boma and Matadi—Kongo River ports—January 3, 1928.—Under date of January 3, 1928, seven cases of yellow fever were reported for the ports of Boma and Matadi, on the Kongo River, Belgian Kongo.

[1] Public Health Reports, Jan. 20, 1927, p. 152.

CANADA

Communicable diseases—Ontario—December, 1927—Comparative.—During the month of December, 1927, communicable diseases were reported in the Province of Ontario, Canada, as follows:

Disease	1927		1926	
	Cases	Deaths	Cases	Deaths
Cerebrospinal meningitis	2	1		3
Chancroid	1		1	
Chicken pox	1,306		1,247	
Diphtheria	449	18	317	
Dysentery		1		
Erysipelas	2			
German measles	16		19	
Goiter	3	3		
Gonorrhea	193		117	
Influenza	2	6		17
Measles	1,223		1,095	1
Mumps	2,166		147	
Pneumonia		126		165
Poliomyelitis	6		2	
Scarlet fever	493	1	534	5
Septic sore throat	3		3	1
Smallpox	381		106	
Syphilis	160	1	86	
Tuberculosis	169	65	113	50
Typhoid fever	73	5	42	6
Whooping cough	342	1	410	4

Smallpox.—Smallpox was reported present during the month of December, 1927, in 35 localities, the greatest number of cases according to locality being as follows: Ottawa, 122 cases; Toronto, 75; Kitchener, 31. At Egremont and East York, 18 cases, each, were reported; at Wilmot Township, 16 cases, Cornwall, and Rockland, each 13 cases. In 10 localities one case each was reported.

Communicable diseases—Ontario—Year 1927—Comparative.—During the years 1926 and 1927 communicable diseases were reported in the Province of Ontario, Canada, as follows:

Disease	Year 1927		Year 1926	
	Cases	Deaths	Cases	Deaths
Actinomycosis	3	2		
Cerebrospinal meningitis	39	25	37	23
Chancroid	36		11	
Chicken pox	8,041		7,787	
Conjunctivitis, acute, infectious	1			
Diarrhea	13	4		
Diphtheria	3,346	205	2,818	179
Dysentery		22		
Erysipelas	9	1		
German measles	4,214	4	3,223	
Goiter	3	3		
Gonorrhea	1,758		1,539	
Influenza	179	156		388
Jaundice, contagious	6	1		
Lethargic encephalitis	16	12	21	16
Measles	13,405	19	18,420	42
Mumps	5,035		1,784	
Paratyphoid fever	1			
Pellagra		1		
Pneumonia		1,488		2,169

Disease	Year 1927		Year 1926	
	Cases	Deaths	Cases	Deaths
Poliomyelitis	51	15	71	6
Puerperal septicemia		5		
Rabies	1			
Scarlet fever	6,289	42	5,640	38
Smallpox	1,523	2	706	3
Syphilis	1,440	6	1,256	
Tuberculosis	1,534	732	1,660	821
Typhoid fever	867	35	581	32
Whooping cough	5,526	29	3,679	67

Communicable diseases—Quebec—Week ended January 7, 1928.—The Bureau of Health of the Province of Quebec reports cases of certain communicable diseases for the week ended January 7, 1928, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Scarlet fever	103
Chicken pox	34	Smallpox	6
Diphtheria	66	Tuberculosis	13
German measles	11	Typhoid fever	4
Influenza	3	Whooping cough	4
Measles	100		

CANARY ISLANDS

Plague—Las Palmas.—A case of plague was reported at Las Palmas, Canary Islands, December 16, 1927.

CHILE

Campaign for prevention of tuberculosis—Housing and sanitary conditions.—Under date of November 2, 1927, the press in Chile was stated to be conducting a campaign for the prevention of tuberculosis through improvement in housing and sanitary conditions for the poorer classes.

CUBA

Communicable diseases—Provinces—October 2–December 24, 1927.—During the period from October 2 to December 24, 1927, cases of communicable diseases were reported from the provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Chicken pox		18	8	4		7	37
Diphtheria	5	23	25	22	8	8	91
Malaria	20	208	2	13	334	1,447	2,024
Measles	8	46	7	3	24	1	89
Paratyphoid fever	17	9	5	20	1	3	55
Poliomyelitis	1						1
Scarlet fever		8	1				9
Tetanus (infantile)			1		1		2
Typhoid fever	51	188	52	120	25	93	529

EGYPT

Plague—Alexandria—December 14, 1927.—On December 14, 1927, two cases of plague occurring in the same family were reported at Alexandria, Egypt. The focus of the disease was stated to be distant about 700 meters from the port and about 500 meters from the house in which the first case occurred.[1]

HAWAII TERRITORY

Plague rats—Paauhau—December 20, 1927.—Two plague-infected rats were reported found dead on the Paauhau sugar plantation, Paauhau, Hamakua, Island of Hawaii, December 20, 1927.

JAMAICA

Smallpox (alastrim)—November 27–December 31, 1927.—During the period November 27 to December 31, 1927, four cases of smallpox, reported as alastrim, were reported in the Island of Jamaica, occurring in localities not included in the Kingston area.

Other communicable diseases.—During the same period other communicable diseases were reported in the Island as follows:

Cases

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chicken pox		11	Poliomyelitis		1
Diphtheria		1	Puerperal fever		3
Dysentery	8	7	Tuberculosis	35	38
Erysipelas		1	Typhoid fever	39	99
Leprosy		1			

Population: Island, 926,000; Kingston, 62,707.

JAPAN

Dysentery—Tokyo, city and prefecture—October 30–November 26, 1927.—During the period October 30 to November 26, 1927, 144 cases of dysentery with 71 deaths were reported in the city of Tokyo, Japan, and 149 cases with 83 deaths in the prefecture of Tokyo, outside of the city. Population of city, 1,995,567; prefecture, outside of city, 2,489,577.

MADAGASCAR

Plague—October 1–15, 1927.—During the two-week period, October 1 to 15, 1927, 63 cases of plague with 59 deaths were reported in the island of Madagascar. The occurrence was reported in four Provinces as follows: Ambositra, 4 cases; Antisirabe, 2; Itasy, 5; Moramanga, 4; Tananarive, 48. Distribution by type of disease: Bubonic, 37; pneumonic, 2; septicemic, 24.

[1] Public Health Reports, Dec. 30, 1927, p. 3218, and Jan. 6, 1928, p. 42.

PERU

Mortality, general—Mortality from communicable diseases—Lima city—October, 1927.—During the month of October, 1927, 385 deaths from all causes were reported in the city of Lima, Peru. Mortality from communicable diseases during the same period was reported as follows:

Disease	Deaths	Disease	Deaths
Cerebrospinal meningitis	9	Plague	1
Gastroenteritis	38	Tuberculosis	91
Influenza	7	Typhoid fever	5
Malaria	8		

Population, estimated, 196,767.

SALVADOR

Mortality, general—Mortality from communicable diseases—July–September, 1927.—During the three months ended September 30, 1927, 7,604 deaths from all causes were reported in the Republic of Salvador. Deaths from communicable diseases were reported as follows:

Disease	Deaths	Disease	Deaths
Diphtheria	4	Tuberculosis	174
Gastroenteritis	210	Typhoid fever	11
Measles	54		

Population, 1,600,000.

Prevailing diseases.—The diseases prevalent in the Republic during the period under report were stated to be intestinal disorders and malarial and other tropical fevers.

TRINIDAD

Vital statistics—Port-of-Spain—November, 1927.—The following statistics for the month of November, 1927, with comparisons for November of the years 1923 to 1926, are taken from a report issued by the Public Health Department of Port-of-Spain:

Month of November

	1923	1924	1925	1926	1927
Number of births	170	142	146	176	186
Births per 1,000 population	32.77	27.38	27.78	33.18	34.81
Number of deaths	126	124	132	126	118
Deaths per 1,000 population	24.29	23.91	25.11	23.75	22.08
Deaths under 1 year	21	26	25	24	17
Deaths under 1 year per 1,000 births	123.53	183.09	171.23	136.36	91.39

Cases of communicable diseases reported during November, 1927

	Cases		Cases
Diphtheria	3	Tuberculosis, pulmonary	10
Ophthalmia neonatorum	8	Typhoid fever	7
Pneumonia	3		

UNION OF SOUTH AFRICA

Plague—Orange Free State.—An outbreak of plague was reported in the Winburg District of the Orange Free State, Union of South Africa, during the week ended November 26, 1927, with 8 cases and 6 deaths. The outbreak occurred on a farm.

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

From medical officers of the Public Health Service, American consuls, Health Section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Week ended—																	
		September, 1927				October, 1927					November, 1927				December, 1927				
		3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31
China:																			
Amoy	C	18	21	19	14	10	4	2											
	D	1	2																
Canton	C	10	17	7	2	6		2	6	5	1	6			1				
	D	6	10	7	2	6		2	6	5	1	5			1				
Foochow	C	P		P	P	P	P	P	P										
Hong Kong	C	1	P	P	P	P	P	P											
	D	1																	
Shanghai	C	1	3	2		1	2												
	D	25	22	21	6	4		2	1										
Swatow	C	P	P		P		P	P	P	P	P								
Tientsin	C	4	3	5	3	2													
India	C	11,180	8,391	6,630	5,189	4,907	4,055	6,142	5,056	5,303	4,845	5,987							
	D	5,559	4,278	3,532	2,526	2,549	2,104	3,027	2,691	2,867	2,641	3,350							
Bombay	C	1	1	1								2							
	D	1	1									2							
Calcutta	C	18	19	20	19	21	13	34	33	28	35	65	71	156					
	D	10	13	5	11	15	11	19	19	22	25	42	49	106	77	55	43	48	
Madras	C	29	8	15	7	4	9		1			6	7						
	D	24	11	6	7	3	3	1	1			3	4	1		1			
Rangoon	C				2	3	1		2		1		1	3					
	D				2	3	1		1	1		3	4	2	1	2	1	1	
Tuticorin	C					1									6		2		
	D					1				7	5	10	15		6	6	2		
India, French Settlements in	C	6	4	1															
	D	3	4	1															
Karikal	C	1									1								
	D	1									1								
Pondicherry	C	4	4	1	6						1								
	D	2	4	1	8						1								
Indo-China: Saigon	C						1			1									

Place		Sept. 1-10	Sept. 11-20	Sept. 21-30	Oct. 1-10	Oct. 11-20	Oct. 21-31	Nov. 1-10	Nov. 11-20	Nov. 21-30	Dec. 1-10
Iraq:[1]											
Amarah	C							35	4	8	3
	D							23	6	8	3
Baghdad	C							1		10	13
	D							1		5	2
Basra	C		21					1			
Diwaniyah	C							28	4	3	1
	D							17	2		
Diyala	C										
	D										
Dulaim	C										
Hillah	C							12	7	3	5
	D							7	6	2	1
Kerbala	C							3	1	4	2
	D							3	1	5	2
Kut	C							11	9	1	5
	D							8	4	1	3
Muntafique	C							4			4
	D							1			2
Ramadi	C								19	18	27
	D								10	23	14
Java: Batavia	C									1	2
	D									1	2
Philippine Islands	C							4			
Siam	C	4	5	21		6	4	8	8	14	23
	D	3	3	11		4	2	5	7	10	15
Bangkok	C	1	1	1			2	3	1		1
	D			1				3	1		1
Straits Settlements: Singapore	C									1	
	D									1	
On vessel S. S. Tabaristan at Basra	C						1				

Place		Nov. 11-20	Nov. 21-30	Dec. 1-10	Place		Sept. 1-10	Sept. 11-20	Sept. 21-30	Oct. 1-10	Oct. 11-20	Oct. 21-31	Nov. 1-10	Nov. 11-20	Nov. 21-30	Dec. 1-10
Iraq:[1]					Indo-China (French)—Con.											
Amarah	C	4	2		Laos	C	16				29	6	10			
	D	2	1		Tonkin	C	23		1						1	
Baghdad	C		1													
	D		3													
Basra	C															
Diwaniyah	C		2													
	D		1													
Diyala	C			1												
	D			1												
Dulaim	C			1												
Hillah	C		5	53												
	D		2	29												
Kerbala	C		2	2												
	D		2	2												
Kut	C		1	5												
	D		1	3												
Muntafique	C		4	14												
	D		2	10												
Ramadi	C	19	18	27												
	D	10	23	14												
Java: Batavia	C		1	2												
	D		1	2												
Philippine Islands	C															
Siam	C	14	23	43												
	D	10	15	25												
Bangkok	C		1													
	D		1													
Straits Settlements: Singapore	C	1		4												
	D	1		4												
On vessel S. S. Tabaristan at Basra	C															

Place		Sept. 1-10	Sept. 11-20	Sept. 21-30	Oct. 1-10	Oct. 11-20	Oct. 21-31	Nov. 1-10	Nov. 11-20	Nov. 21-30	Dec. 1-10
Indo-China (French)	C	452	206	241		345					
Annam	C	388	146	106		140	27	13	75	38	16
Cambodia	C	8	25	42		97	5	56	1	28	21
Cochin-China	C	17	35	92		79	12	21	27	52	17

[1] From July 24 to Oct. 8, 1927, 831 cases and 617 deaths from cholera were reported in Iraq, of which 131 cases and 103 deaths occurred in Amarah; 416 cases and 337 deaths in Basra; 53 cases and 30 deaths in Diwaniyah; 7 cases and 5 deaths in Hillah; 31 cases and 18 deaths in Kerbala; 8 cases and 6 deaths in Kut; and 185 cases and 118 deaths in Muntafique.

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

PLAGUE

[C indicates cases; D, deaths; P, present]

Place		Week ended—																	
		September, 1927				October, 1927					November, 1927				December, 1927				
		3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31
Algeria: Oran	C		1																
	D		1								1		1						
Argentina:																			
Bahia Blanca District	C													1	1	1			
Cordoba Province	C					P	P	P	P	P	P			10				1	1
Firmat	C																1		
Quilino	C													1	1	1			
Rosario	C													1	1	1	1	2	3
Unacha	C																1		
Azores: St. Michaels Island	C		1		1	1			2	1		1	1	1	1	1			
	D		1			1										1			
British East Africa:																			
Tanganyiki	C				P	P		P	P	P	P								
Uganda	C	96	48	47	35	25	46	28											
	D	67	44	25	22	23	39	26											
Canary Islands: Las Palmas	C						4	4	1					1			2		
Ceylon: Colombo	C	1		1	1	2			1					1	1				
	D	1		1	1	1													
China: Tungliao	D							200											
Egypt:																			
Alexandria	C	1												5	2	2	2	1	
	D													5	2				
Suez	C		1																
Greece:																			
Mitylene	C				5		1			1		2		1	1	1			
Patras	C	2				1					1								
	D					1					1								
India	C	403	1,087	612	608	655	715	920	956	812	1,015	856							
	D	216	569	324	319	381	359	508	544	495	551	485							
Bombay	C	3	1	1	2		2		2										
	D	2	1	1	1		2		1										
Calcutta	C	18																	
	D	10																	

Madras	C	144	111	87	123	88	156	167	172		83	152							
	D	76	62	43	49	60	72	72	84		54	80							
Rangoon	C	2		4		3	4	1	3	5	2		4	5	2				
	D	2		4		3	4	1	3	5	2		4	5	2			2	
Indo-China: Saigon	C		1	1									1						
Java:																			
Batavia	C	18	14	17	21	24	33	42	31	41	29	31	34						
	D	18	14	17	21	24	33	41	31	41	29	31	34						
East Java and Madura	C	5	4	2	7	3	3	7	4	3	4	2	1						
	D	5	4	2	7	3	3	7	4	3	4	2	1						
Senegal:																			
Baol	C	32		27	13	39		56					P		P				
	D	11		15	7	26		14											
Cayor	C	81	103	175	104	101	45	20	10	32	8	8	P						
	D	27	58	90	58	57	16	10	5	20	4	4							
Dakar	C	9	5	5	1	1													
	D	4	4	3	1														
Louga	C				5		8												
	D				4														
Rufisque	C	4	9	2	1														
	D	3	7	1	1														
Thies	C	2		2	5					1									
	D	2		1	4														
Siam	C						1	11	1					2					
	D						1	8			1			1					
Bangkok	C						1		1										
	D										1								
Turkey: Constantinople	C				1	1								1					
	D					1													
Union of South Africa:																			
Cape Province—																			
Richmond District	C									2									
	D									2									
Orange Free State	C												1	8	P				
	D												1	6					
U. S. S. R.:																			
Chita District	C							1											
	D							1											
Northern Caucasus	C		3	1	10	1													
On vessel:	D		2	1	7														
S. S. Aghios Gerasimos at Vigo, Spain	C												3						
At La Plata from Rosario, Argentina	C																		1

Indo-China (French), 20 cases, Sept. 1–Nov. 10; Beirut Syria, 1 case, Sept. 1–10; 1 case, Oct. 21–31; 1 case, Dec. 1–10.

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

PLAGUE—Continued

Place		July	August	September	October	November
Algeria: Algiers	C				2	
British East Africa: Kenya	C	13	61	21	18	
Ecuador: Guayaquil	C	5	7	3	4	9
	D					3
Madagascar	C	46	98	170	166	
	D	43	89	154	155	
Ambositra Province	C	6	1			
	D	6	1			
Antisirabe Province	C		34	5		
	D		34	4		
Itasy Province	C	14	11	21		
	D	14	7	20		
Madagascar—Continued.						
Moramanga Province	C	5	4	3		
	D	5	4	3		
Tananarive Province	C	21	48	142		
	D	19	43	127		
Mauritius	C			1		
Peru	C	8	11	15	14	
	D	7	6	6	5	
Callao	D	3				
Lima	D	3			1	

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Week ended— September, 1927				October, 1927					November, 1927				December, 1927					Jan. 7, 1928
		3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	
Algeria	C										294	218	149							
Algiers	C																3			
Oran	C										10	4	6	9	11	10	9			
Arabia: Aden	C												1		1		1			
Brazil: Rio de Janeiro	D			6						1										
British East Africa: Tanganyiki	D			8				7	P	P	P	P								
British South Africa:																				
Northern Rhodesia	C		18	16	5	10	97	44	13	150	10	22	3	57						
	D				2	3	7	1	4	40	23		1	18						
Southern Rhodesia	C												3							

Canada:																				
Alberta	C	3	1	5	8	5	4	5	9	6	2	1	1	7	3	3	6		3	
Edmonston	C									1				6		1	1			3
British Columbia—																				
Vancouver	C	2														4				
Manitoba	C	2		7			2		5	3	14		2	1	3	1	2	2		
Winnipeg	C			4			1		1				2			1	1	1		
New Brunswick	C			2																
Nova Scotia	C			1				1										1		
Halifax	C							1												
Ontario	C			12	10	6	26	26	38	64	38	77	85	71	90	82	104		53	
Hamilton	C														2					
Kingston	C												1					1		
Ottawa	C	9	13	12	6	3	15	23	26	47	17	51	19	10	19		34	18	9	20
Toronto	C		1		1		3	1	6	2	16	3	13		25	14		7		
Windsor	C							9												
Quebec	C								8	7	3	12	3	8	5	3		14	3	6
Montreal	C											1						1		1
Quebec	C														2		2		2	10
Riviere du Loup	C												3							
Saskatchewan	C	13	33		22	12		8	11	5	12	2	14	9	15	19	15	12	13	
Moose Jaw	C		9		7				3								1		1	2
Regina	C						5					1					1			
Saskatoon	C															2			4	
Ceylon: Colombo	C														1					
China:																				
Canton	C				1															
	D				1															
Chefoo	C				1			P		P				P						
	D				1															
Foochow	C		P					P	P		P			P						
Hong Kong	C	2																		
	D	1		1																
Manchuria—																				
Changchun	C													1						
Dairen	C								1		2									
	D								1											
Fushun	C			1								1								
Mukden	C								1	1										
Pensihu	C					1														
Tientsin	C					1			1	8				4	1					
Egypt	C	3													4					
	D	1				1														
Cairo	C														1					
Great Britain:																				
England and Wales	C	111	146	126	125	122	149	124	200	199	219	258	226	233	366	230	212	255		
Bradford	C									1	5	3	2	9	6	2	2	2		
Bristol	C								6	1			3	2	4	2				
Cardiff	C									1										
Leeds	C	3				3	1		6	1	1	1	2	3	3	6	4	4		
Manchester	C						1	2			1	1	4	2	5	10	8			
Newcastle upon Tyne	C			2		1		5		2	6		1	28	18	5	4	2	13	
Sheffield	C				1		3	3	4	4			2	1	8					

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

SMALLPOX—Continued

Place		Week ended—																		Jan. 7, 1928
		September, 1927				October, 1927					November, 1927				December, 1927					
		3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	
India	C	1,456	1,109	1,111	722	923	593	777	860	779	805	1,235								
	D	397	266	284	173	179	159	171	206	190	200	211								
Bombay	C	7	3	1	1	4	2		4	2		2			4					
	D	5	2	1					2	2		1			1					
Calcutta	C	4	6	10	2		4	1					5	4	3					
	D	2	5	5	2		3	1	1				2	2	1					
Madras	C	2		3	2	3	1	2	2	3		2	2	2	2	5				
	D			1	1					1		1		1	1	1				
Rangoon	C	2		1	6	2	8		7	4		1	1	5	2					
	D	1			1	1	1		1	1				1	1					
India, French settlements in:																				
Karikal	C				1															
	D				1															
Pondicherry	C	11	8	2	16	9	7	10	12											
	D	11	8	2	16	9	7	10	12											
Indo-China: Saigon	C		1																	
Iraq:																				
Baghdad	C		1			5			2			5		1	5					
	D		1			3			1			4			5					
Basra	C			4				2					3							
	D			4				2					1							
Italy: Rome and vicinity	C		1																	
Jamaica (outside Kingston) (alastrim)	C	2	2	2	3	1	4	4		7				1		1	1		2	
Kingston (alastrim)	C	2		1			2													
Java:																				
Batavia	C					3		1				25								
	D											15								
East Java and Madura	C		14	3	5	1		7		1	3	5								
	D							1												
Mexico:																				
Acapulco	C	1		1								1								
	D	1		1								1								
Guadalajara	D													1			1			
Mexico City and surrounding territory	C													1	1	1	1			
Torreon	D						2													
Palestine: Jerusalem	C														1					

Portugal:																				
Lisbon	C	1		1	1	1	4	1	2	1	2									
Oporto	C		1																	
Siam	C	24	3		*		3	3					1							
	D	14	1																	
Bangkok	C												1							
Spain:																				
Malaga	D												1							
Valencia	C					1														
Union of South Africa:																				
Cape Province	C						P													
Orange Free State: Bothaville District	C												P	P	P					
Transvaal: Johannesburg	C													7						
Venezuela: Maracaibo	D			2			1													

Place		September, 1927			October, 1927			November, 1927			December, 1927
		1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10
Algeria	C	110	162	110	182	386	115				
Oran	C	4		12	6		5				
Indo-China	C	6	6	9	5	4	16	13	3	22	10

Place		September, 1927			October, 1927			November, 1927			December, 1927
		1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10
Syria:											
Beirut	C										1
Damascus	C		1	4	14	8			13		4

Place		July	August	September	October	November
Angola	C	42	2	5	73	
	D				2	
Congo	C			5	77	
Cuanza-Norte	C			1		
Cuanza-Sul	C				2	
Loanda	C			1		
Zaire	C			3		
Brazil: Porto Alegre	C	5	3	3	4	
British East Africa: Zanzibar	C				2	
	D				1	
Chosen	C	19	2			
	D	6				
Ecuador, Guayaquil	C		2	2	1	1
France	C	23	6	8	7	4

Place		July	August	September	October	November
Gold Coast	C	1	1	5		
Greece	C	3	3	4	4	
Latvia	C				2	
Mexico	D	93	73	55		
Morocco	C	53	76	51	81	
Nigeria	C	492	91	237		
	D	83	20	70		
Spain: Madrid	D					1
U. S. S. R.:						
Railways, etc	C	11	6			
Other territories in Europe	C	146	111			
Transcaucasus, Siberia and Central Asia	C	36	29			
Ukraine	C	16	4			

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

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Week ended—																
		September, 1927				October, 1927					November, 1927				December, 1927			
		3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24
Bulgaria: Sofia	C					8	4	3	2	3	1	2					1	
	D										1							
Chile:																		
Antofagasta	D					1												
Valparaiso	C	1												1	1			
	D	1											1					
China:																		
Manchuria: Harbin												1						
Tientsin	C				2													
Egypt	C					3	3	5	1		4			1	7			
	D					2	1	1	1						5			
Port Said	C					1									1			
Ireland:																		
Cork County	C															3		
Donegal County—Letterkenny	C								4									
Mexico: Mexico City (including municipalities in Federal District)	C	9	4	1	5	7		3	8	9	6	2	11	7	6	4		4
	D										2						1	1
Palestine	C	3		5			3						2	3	1			
Haifa	C						2						1	1				
Herzliah	C													1				
Jaffa	C					1								1				
Nazareth	C												1					
Safad	C													1				
Tel-Aviv	C						1							1	1			
Poland	C	12	5	12	6	10	9			35	12	6			28			
	D			2		3	1			6	3				5			
Portugal: Oporto	C									1								1
Rumania	C	2	2	9	3	5							2					
	D					1												

Syria: Aleppo	C			2				2	1			1							
Tunisia	C			1															
Union of South Africa:																			
Cape Province	C	P				P	P	P	P		P	P	P	P	P				
Natal	C								P		P	P	P	P	P				
Orange Free State	C					P													
Transvaal	C										P	P	P	P	P				
Johannesburg	C							5											

Place		September, 1927			October, 1927			November, 1927			December, 1927
		1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10
Algeria	C	5	3	2	7	4	1				
	D					1					
Algiers	C	1	5		1	1					
Bulgaria	C	5	1	1		1	1				
	D		1	1		1					
Morocco	C	3	2	2	6	4	1	5	14	7	5

Place		July	August	September	October	November
Argentina	C					1
Chosen	C	72	17			
	D	8				
Chemulpo	C	1	2			
Gensan	C	2				
Seoul	C	2	3		2	
	D	1			1	
Czechoslovakia	C	6				
Greece: Athens	C	1				
Japan	C	1				
Latvia	C	6				
Lithuania	C	44	18	7	9	
	D	5	8	1	1	
Mexico	D	12	38	14		
Peru:						
Arequipa	D		2	1	2	
Lima	D	8				
U. S. S. R.:						
Railways, etc	C	30	22			
Transcaucasus, Siberia, and central Asia	C	79	69			
Ukraine	C	96	85			
Other territories in Europe	C	732	552			
Yugoslavia	C	11	9		1	1
	D	4	1			

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

YELLOW FEVER

[C, indicates cases; D, deaths; P, present]

Place		Week ended—																
		September, 1927				October, 1927				November, 1927				December, 1927				
		3	10	17	24	1	15	22	29	5	12	19	26	3	10	17	24	31
Belgian Kongo: Boma and Matadi	C																	7
Dahomey: Grand Popo	C												1					
	D												1					
Liberia: Monrovia	C		1															
Nigeria	C			2														
	D			2														
Senegal	C					5		5	9	16	6	7						
	D					5		4	8	10	4	6						
Dakar	C			P					3	6		5	2	1	4			
	D								2	4		4	2	1	4			
Geoul	C					1												
	D					1												
Goree, Island of	C	2																
	D	2																
Kebener	C						1	1										
	D						1	1										
Kelle	C						2		1									
	D						1		1									
Keur Samba Kane	C								1	1								
	D									1								
Keur Madiop	C								1									
	D								1									
Khombole	C					1						1						
	D					1						1						
Louga	C					1			2	1	1							
	D					1			2	1	1							
Mekhe	C							1	1	2	2							
	D								1	1	1							
M'Dande	C							1		2	1							
	D							1		1								
Pout	C				1													
	D				1													

Place																		
Rufisque	C						1											
	D						1											
St. Louis	C					1												
	D					1												
Sebikotane	C							1		2	1							
	D							1			1							
Thies	C			1	2	1		1	1	2	1	1						
	D			1	2	1		1	1	2	1	1						
Tiaroye	C	1																
	D	1																
Tivaouane	C		1															
On vessel S. S. Desirado, at Leixoes, Portugal	C			1														
	D			1														

Place		July	August	September	October
Gold Coast	C	15	2	6	1
	D	4	2	4	1