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## A NOTE ON THE HISTORY OF PELLAGRA IN THE UNITED STATES

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In connection with the epidemiological studies (1) of pellagra in Spartanburg and neighboring counties of South Carolina, which were begun early in 1916, it very soon became apparent that the disease had been prevalent in that section for a longer period and to a greater extent than had been generally accepted. This early impression was gained largely from frequent references by pellagrins to recurrent attacks extending over a long period and by many of the older residents to conditions observed years before, many of which, from the descriptions furnished, could easily have been, and in all probability were, pellagrous in nature. Such observations prompted inquiries among some of the older local physicians, many of whom could quite distinctly recall cases encountered in the early days of their practice which, in view of their more recently acquired knowledge of the disease, they felt quite positive were genuine cases of pellagra.

Considerable information of historic interest, all of which is in harmony with the above, has been accumulated from various sources. As early as 1864, Gray of New York, and Tyler, of Massachusetts, each reported a case of pellagra. Sherwell of New York reported cases in 1882 and 1902. Harris, of Georgia, reported a case complicating hookworm disease in 1902. In 1912, Babcock (2), a pioneer student of pellagra in this country, from a study of the clinical records of the South Carolina State Hospital for the Insane, and from personal interviews and correspondence with practitioners, asylum authorities, and others concerned, reached the conclusion that the disease had been continuously present in South Carolina at least since 1828. He also presented information indicating that the same may be said of many other sections of the South. Searcy (3), the first to report pellagra in endemic form in this country, states that there had been cases present but unrecognized at the Mount Vernon (Alabama) asylum each year at least since 1901. From a superficial survey of the Peoria (Illinois) State Hospital following the diagnosis of the first case, Siler and Nichols (4) found many cases present, and from their study of this institution they concluded that the disease had been present there

without recognition for not less than four years prior to the time of their investigation. Interesting reports of the experiences of practitioners and institution officials with the disease before they knew its nature are frequently encountered in the early American literature on pellagra, and the disease in endemic form has been traced back by various observers in various sections to 1885 and beyond.

In order to secure and place on record such information bearing on this point as was then (1916) available in the general vicinity of Spartanburg, S. C., a letter embodying the following request was addressed to those physicians who had entered general practice prior to 1903 as shown by the fourth edition 1914 of the American Medical Directory:

The question as to the extent of pellagra in this section prior to its general recognition in the South in 1907 and 1908 is of unusual interest in connection with the present studies of the disease.

It is therefore desired to utilize in this connection your long experience as a practitioner by requesting you to state, in the blank space below, the place of occurrence and date of your first case of sickness which, when considered in the light of your present knowledge, would justify a diagnosis of pellagra.

Place of occurrence _____

Date of occurrence _____

REMARKS

_____

_____

_____

(Signature) _____

In all, 62 replies were received. Of this number, 38 reported having seen, prior to 1907, one or more cases of pellagra. Eighteen had not seen, or could not recall having seen, a case at an earlier date than 1907, two of this number reporting that they had never seen a case in their own practice at any time. Six were indefinite in their replies.

The cases reported as having been observed prior to 1907 are summarized by years of occurrence as follows:

| Year | Cases | Year | Cases | Year | Cases |
|---|---|---|---|---|---|
| 1885 | 1 | 1893 | 1 | 1901 | 2 |
| 1886 | 1 | 1894 | 1 | 1902 | 4 |
| 1887 | 1 | 1895 | 1 | 1903 | 9 |
| 1888 | 1 | 1896 | 0 | 1904 | 6 |
| 1889 | 1 | 1897 | 0 | 1905 | 5 |
| 1890 | 0 | 1898 | 2 | 1906 | 4 |
| 1891 | 0 | 1899 | 3 | | |
| 1892 | 0 | 1900 | 2 | | |

It will be noted that the 38 physicians report, in retrospect, a total of 45 cases and make reference to several more cases (though only

the earliest was requested) of a condition which, in the light of knowledge subsequently acquired, they believed was pellagra. The earliest case mentioned was observed in 1885 and, with a few exceptions, at least one such case was encountered each year thereafter by this comparatively small group of physicians.

There appears to be a general tendency toward an increase in the number of cases as the years advance. This may, in part at least, be due to the increasing number of physicians comprising this group, with a proportionate increase in the cases thus reported. However, the gradual shift in economic and dietetic conditions in this locality, brought about by changes in agricultural practices (increased production of cotton at the expense of foods and forage crops), as potential factors in bringing about an actual progressive increase in pellagra incidence during this period, can not be left out of consideration.

While no individual case reported under the circumstances can or should be regarded as unquestionably that of pellagra, the combined experience of this group of physicians becomes quite impressive when viewed as a whole. Further emphasis is afforded when it is considered that, in the present day, when pellagra is known to be quite prevalent in this locality year after year, and the probability of its occurrence and the nature of its symptoms are fully appreciated, not all the general practitioners see so much as one case per year. Two of the physicians replying to the previously mentioned request reported that they had not yet (1916) seen a case in their own practice. One of these entered practice in 1868, the other in 1895.

Interesting information bearing on this phase of the question is furnished by the epidemiological studies (5) of the Public Health Service conducted in portions of this field during 1916, 1917, 1918, 1919, 1920, and 1921. During this period the writer was in close touch with more than 50 local practitioners and believes that he had their cooperation in reporting their current cases to an unusual degree. The majority of them reported no more than a few (1 to 12) cases each year; many of them went as long as two years (1919–20) without encountering a single case, and some saw none at all during the entire 6-year period. In fact very few of these physicians reported a case of pellagra during the years 1919 and 1920. While the incidence was very low during these two years as compared with that of 1917–18 and 1921, the disease was by no means absent, as the house-to-house canvass conducted throughout this study fully demonstrated. In 1917 the incidence rate in a local community was found to be 99 per 1,000 population; in 1918, 83; 1919, 19; 1920, 14; and in 1921, 46, the last figure being more than three times that found in the same population during 1920 and more than twice the 1919 rate.

The situation becomes even more interesting when these earlier or prerecognition experiences are considered in connection with the information furnished by the house-to-house canvass conducted during 1917. The study that year included 24 cotton-mill communities, representing a population of 22,653, which furnished a total of 1,147 cases of pellagra, or a gross incidence of 50.6 per thousand persons. In 9 of the 24 villages, representing 478 cases of pellagra, it was practicable to check up with a fair degree of accuracy the proportion of the cases found by the method of house-to-house canvass that had actually been seen professionally by a physician. Of the 478 cases only 38 (7.9 per cent) had received professional attention during the attack. Making due allowance for all conceivable errors in this respect, it is conservatively estimated that of all the cases recorded during that year not more than 10 to 15 per cent came to the attention of a physician. As a rule, only the more severe and aggravated cases sought medical relief; and there are no good reasons for believing that such has not always been the case, except possibly during the short wave of pellagraphobia which immediately followed the general recognition of the disease. During this period, perhaps a somewhat larger proportion came to light through professonal channels.

The principal argument against the existence of pellagra in the South to any considerable extent prior to its general recognition in 1907–8 is the fact that it was not so recognized. This position may appear reasonably sound when taken at face value; but there are many valid reasons why the most competent physician might have failed to recognize the disease. Few of the older American textbooks on medical subjects mention it. Such well-known books as Flint's Practice of Medicine, published in 1866 and revised in 1880, American Text Book of the Theory and Practice of Medicine (1887), Musser's Medical Diagnosis (1896), and other standard works of that period make no reference to such a condition. In the first seven editions of Osler's Principles and Practice of Medicine the disease receives scant notice, the brief reference to it embodying the statement that "it has not been observed in the United States." In a later (eighth) edition of his work this author states that "it has probably been present in the South for 50 years."

At the very most the information regarding pellagra available to the average student of medicine in the United States prior to 1908 was that it is a disease of unknown or uncertain etiology, occurring in Italy and a few other places in southern Europe; that it involves the cutaneous, digestive, and nervous systems, producing a classical and essential diagnostic triad—dermatitis, diarrhea, and dementia; and last, but by no means less stressed, that it did not occur in the United States.

We now know that even this meager description contains some outstanding fallacies that could not do other than militate against the recognition of the disease, if, indeed, they did not produce a decided prejudicial effect against such a diagnosis in this country. The impression that a disease does not exist in a given locality is just as much a hindrance in arriving at a correct diagnosis as the knowledge of its continuous presence in endemic form is of assistance. It is no hidden secret that with all our knowledge of modern diseases the diagnosis of yellow fever or plague is made with less hestitancy and greater assurance where that particular disease is known to be endemic, to say nothing of the moral support often afforded in the diagnosis of such well-known diseases as smallpox or measles by a known epidemic. It is not at all improbable that prior to 1908 the average American physician was about as indifferent to the diagnosis of pellagra as are those of the most northern latitudes to the endemic existence of such conditions as sleeping sickness or leishmaniasis.

The reports of cases of pellagra published in 1864 and 1902 were mainly ignored or their authenticity was questioned until confirmed by the developments of later years. Babcock (2) quotes Dr. D. S. Pope, of Columbia, S. C., as stating that about 1885 he incorrectly ruled out the diagnosis of pellagra in two cases on the grounds that it "did not occur in the United States," and adds that he knows of others who have pursued a similar course "out of respect for authority."

The triad—dermatitis, diarrhea, and dementia—formerly almost universally held essential to the diagnosis of pellagra, is, relatively speaking, of rather infrequent occurrence when all types of endemic pellagra are considered. Such a combination of symptoms, as is now fully appreciated by most physicians familiar with the disease represents an advanced stage and is rarely encountered except in some of the more severe types. Of 313 admissions to the United States Pellagra Hospital at Spartanburg, S. C., 62.4 per cent had normal bowel movements at the time of admission, 17.2 per cent were constipated, and 20.4 per cent had looseness of the bowels. Of 421 unselected field cases, 80.5 per cent reported no bowel disturbance, 9.7 per cent had looseness of the bowels, and 9.7 per cent were constipated. All the hospital cases showed the presence of the characteristic skin eruption at the time of admission, as did the field cases at the time the information was obtained. Of 876 field cases under observation throughout the immediate attack, all of whom presented the skin eruption, 12 (1.4 per cent) showed definite mental involvement of a major order which might be considered attributable to the disease. Five of these terminated fatally while under observation.

In view of these and similar observations this so-called diagnostic triad is to be looked upon as an indication of severity or a terminal picture rather than the essential symptoms of the ordinary case. If

this diagnostic requirement were uniformly applied in the present day the reported morbidity would represent a still smaller fraction of the cases actually existing, and the indicated case fatality rate would be nearer 100 per cent than around 3 per cent, which, according to the best information available (5), is in the neighborhood of the correct figure for this locality.

Another factor worthy of mention that could conceivably have operated against the earlier recognition of pellagra is the ease with which the symptoms composing this triad may be confused with other and, at the time, better known conditions. The skin eruption might easily be, and is to this day, often confused with other forms of erythema and dermatitis, such as the various types of eczema, erythema multiforme, lupus erythematosus, ichthyosis, Raynaud's disease, ergotism, senile atrophy and pigmentation, vegetable poisoning, and ordinary sunburn. The diarrhea has been mistaken for intestinal tuberculosis, dysentery, etc. The mouth symptoms were often disposed of by simply classing them as stomatitis or glossitis from some local cause. In many instances they were believed to represent a form of scurvy. The mental symptoms typify some of the well known psychoses and could have been so classified. In other words, a most classical and well advanced case of pellagra might readily have been looked upon by those unfamiliar with the disease and not aware of the possibility of its occurrence as a complex produced by various conditions. This is the very nature of some of the early descriptions of the disease, and it is a notable fact that such entries in the clinical records of the South Carolina State Hospital and other southern insane asylums actually showed a compensatory decline following the recognition of pellagra (2). No other disease has enjoyed so many aliases. Asturian leprosy, alpine scurvy, erythema endemicus, scorbutic palsy, Lombardian leprosy, Italian elephantiasis, periodic erysipelas, mal de sole, and in this country scurvy with sunburn, psilosis pigmentosa, foot and mouth disease, etc., are some of the more outstanding misconceptions that have prevailed at one time or another. The chaos of the past can best be appreciated when it is considered that there are still some (6) who hold that pellagra is not a clinical entity.

It is not contended that this disease was as prevalent prior to 1907 as it was found to be during the years immediately following. In view of certain inevitable dietary readjustments resulting from shifting economic conditions which are now looked upon as the dominating factors in the epidemiology of the disease, there might easily have been, and it is probable that there was, an increase in incidence following the economic depression which began in 1907, as brought out by Sydenstricker, (7) just as there have been known increases following similar changes in 1915, 1921, and 1930. Granting that

there was "an explosive outbreak" which began in 1907–8, when all available information is considered one is led to wonder which was the more explosive in character, the actual increase in cases or the suddenly acquired knowledge of the disease and the realization of its presence aided by a rapidly spreading pellagraphobia and stock taking by physicians.

It is a question whether this apparent epidemic nature has not been overestimated, to the hindrance of some of the earlier investigations undertaken to clear up its etiology. Such prerecognition information as has been brought together offers meager support to the view, perhaps too commonly held, that pellagra made a sudden appearance in the South and quickly assumed epidemic proportions analogous to that of an infectious condition. In view of its undoubted endemic existence prior to that time, and with no reliable means of measuring its incidence before or even since, the generally accepted basic requirements for the recognition of an epidemic are not entirely applicable. However, several observers have been able to see in this situation what they regard as evidence, not only of a sudden and explosive appearance but, in a few instances, a definite radial spread and, apparently on these grounds alone, have held on to the view of infectious origin.

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## SLEEPING CAR PARKING AND SANITATION AT A LARGE CONVENTION

By G. H. Ferguson, *Chief Sanitary Engineer, Department of Pensions and National Health*

During the period that Pullman and dining cars were parked in the coach yards at Toronto, Canada, in connection with the Masonic Shrine convention, June 9–12, 1930, the various official bodies concerned took measures to maintain a high standard of sanitary conditions. The railways concerned provided extra men and materials at

considerable expense. The Canadian Pacific Railway is stated to have spent over $100,000 in building and maintaining their special coach yards, which were known as "Fez City."

*"Fez City"*

This yard, located at the south end of Bathurst Street, was constructed expressly for the parking of coaches used as living quarters during the convention and was dismantled when no longer required for this purpose.

Hydrants, connected to the city water supply, were located at regular intervals throughout the yard, and steam-hose couplings were used on the hydrants and filling hose for ease in attaching them to the cars.

Ice was stored at the side of the yard in a refrigerator car, and, when required for use, was transported to the cars in metal wheelbarrows painted white. Special galvanized pails were used to carry broken ice into the cars. The service men were supplied with white uniforms and white rubber gloves.

Garbage and rubbish were collected in cans throughout the yard, open end carbide cans being used for the rubbish. From time to time these containers were taken to the disposal yard and emptied into city garbage wagons. Garbage and trash were disposed of at the city incinerator.

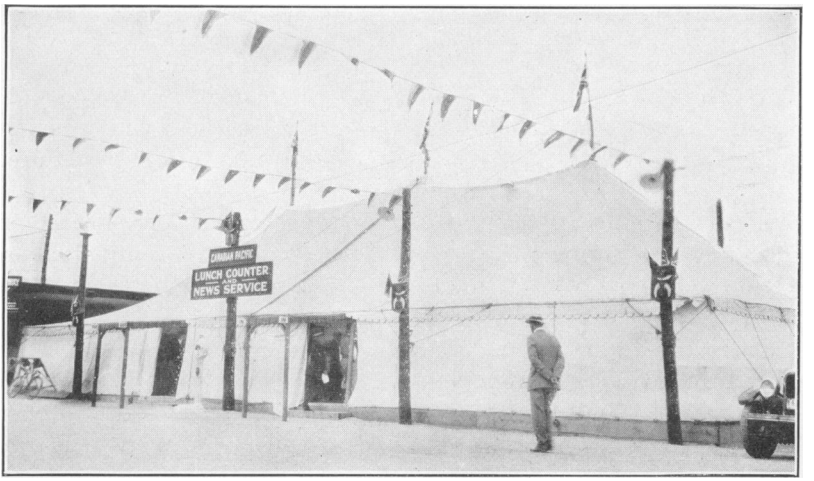
A special corrugated sheet metal building was constructed and equipped with 2-compartment showers. The outer compartment was provided as a dressing room and was supplied with a chair. The walls and doors of the showers were of sheet metal. Attendants supplied towels and soap. A charge of 50 cents was made for the entire service. Twenty shower compartments were provided for men and six for women. Toilets, latrines, washbasins, and a barber shop were also located in this building. One section, reserved for ladies, was equipped with toilets, washbasins, showers, and a sitting room.

In addition to the toilets in the coaches outside toilets were provided, those for the delegates being separated from those intended for the use of railway employees.

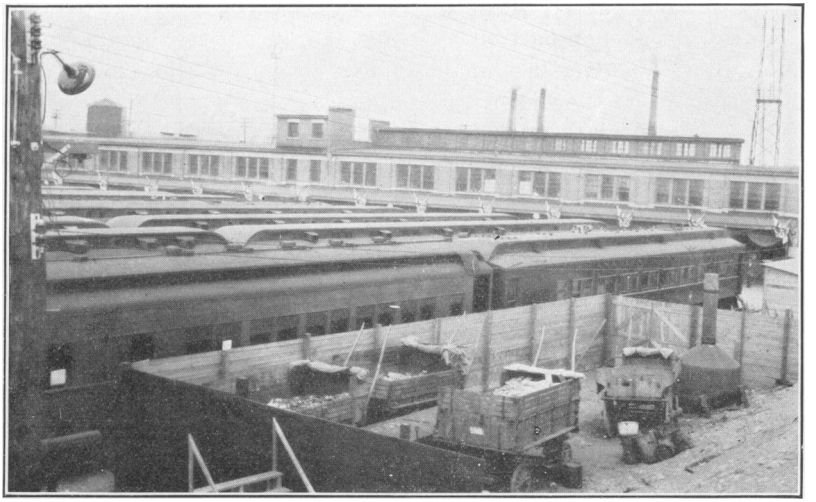
To provide toilet and bath facilities for porters employed on the cars an old box car was removed from its trucks, reconditioned, and fitted with necessary conveniences.

Waste water from the baths and toilets was conveyed to a city sewer.

Sewage disposal cans, 11 inches in diameter and about 35 inches long, were specially constructed for the collection of sewage from the cars. A 6-inch ring of galvanized metal, the same as that used in the cans, fitted into the top of the cans and a heavily oiled cloth was

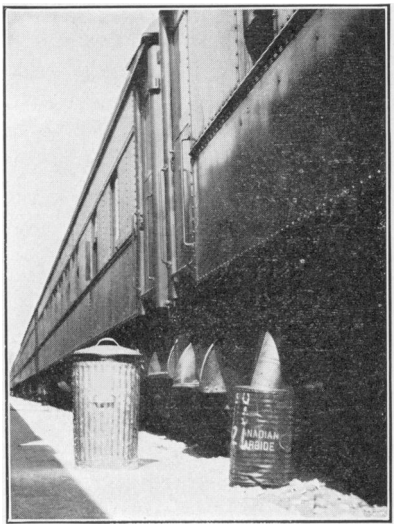



LUNCH COUNTER TENT AT THE ENTRANCE TO "FEZ CITY"

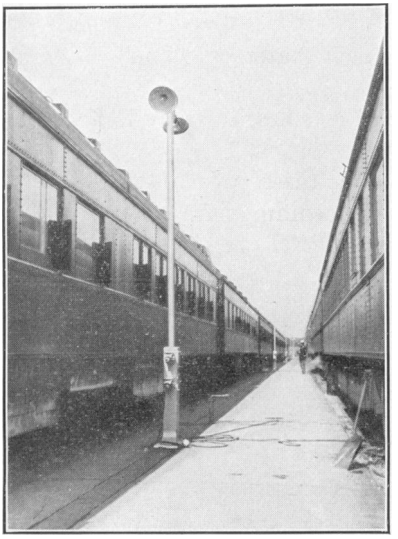


ARRANGEMENTS FOR GARBAGE REMOVAL AT "TEMPLE PARK"

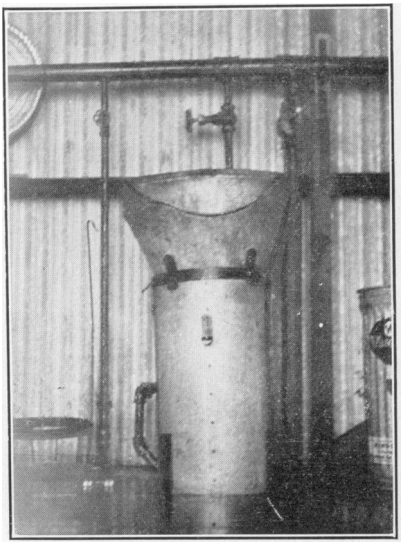
NARROW GAGE TRACK, TEMPORARY PIPE LINE, HYDRANTS, AND TRUCK WITH ICE




SANITARY GARBAGE CAN IN POSITION



LIGHT STANDARD, CONCRETE WALK, AND WATER HYDRANT



SANITARY HOPPER

fastened to the inside of this ring. This cloth was wired around the toilet and waste pipe outlets when the can was in place. The cans were provided with handles for ease in handling. On the side of the tracks where no walks were provided 10-inch planks were nailed to the ties, providing a level base for the cans. Close-fitting metal covers were placed on the cans when transporting them to and from the disposal yards. Trucks hauled by a small motor were used in moving cans. The contents of the cans were emptied into 50-gallon wooden barrels provided with covers which could be clamped tightly in place. These barrels were then removed by truck and emptied into a city sanitary sewer. The sanitary cans were washed with water, and this water was discharged into a septic tank which overflowed into a city storm sewer. A plentiful supply of chloride of lime was available, and a strong solution was added to the effluent from the septic tank from time to time. After being washed, the cans were disinfected, then the covers were replaced, and the cans were again ready for use.

Between alternate rows of coaches, raised walks were built of clay and finely crushed rock, enough of the latter being included to provide good drainage. Electric lights were strung on wires supported by wooden poles located in these walks.

Two stationary locomotives provided steam for the coaches and hot water for the showers.

At the entrance to the yard two large tents were erected, one being used as a lunch counter and the other as an information bureau, telegraph office, and express office.

A frame administration building was located on an elevation at the western end of the yard.

Three hundred and twenty-eight coaches, including dining cars, were located in this yard.

In connection with the sanitary facilities provided for the 4,500 persons who were furnished sleeping accommodation at "Fez City," extra men were employed as follows:

Water supply, 12 men.

Ice supply, 12 men.

Sewage disposal handled by contractor with 45 men.

Garbage disposal and general yard cleaning, 55 men.

For handling the sewage between the Pullman cars and the point of disposal in a city sanitary sewer 1,600 cans of the type described were specially manufactured.

Special precautions taken in connection with sewage disposal included the screening of sewer hopper to prevent clogging, protected covering between toilet outlet and sanitary can, and provision for disinfection of sanitary equipment and grounds around disposal sheds and cars

## *"Temple Park"*

While no definite figures are at hand regarding the exact amount of money that was spent by the Canadian National Railway system in their special coach yard, which was named "Temple Park," it has been unofficially stated that the railway company spent as much on parking and sanitary facilities as did the Canadian Pacific Railway Co.

A letter from the assistant general passenger agent of the Canadian National Railways at Toronto contains the following statement:

> I am pleased to advise you that Canadian National Railways parked 375 Pullmans in their parking location at Toronto last week. We estimate there were just over 7,000 passengers taken care of by this means. Sanitary arrangements received exceptional attention, and our complete facilities were very well commented upon by our visitors, also by representatives of the Pullman Co. and by American railway lines officials who were used to the handling of this very large convention each year.

The chief engineer for the central region of the Canadian National Railways has supplied the following data with respect to temporary facilities that were made available in their special parking area known as "Temple Park."

The number of extra employees required to handle the equipment in the parking area amounted to 248, of which 189 were required for taking care of what might be considered sanitary conditions, as follows:

Sanitary arrangements, 103.
Watering cars, 30.
Icing cars, 30.
Collecting garbage, 14.
Cleaning yards, 12.

The remainder of the employees making up the total of 248 consisted of electricians, pipe fitters, 4 janitors who looked after the administration building, 2 car inspectors, 2 oilers, 6 coal men for coaling dining cars, and 2 firemen for looking after the steam boiler in the Annex.

Water for drinking, culinary, washing, and sanitary purposes was supplied through hydrants connected to the city water service and spaced at regular intervals throughout the yards. Standard hose coupling connections were used in attaching the service hose to the hydrants. The filling end of the hose was cut off square and when not in use was protected by a metal cylinder, with a closed end, which fitted snugly over the hose.

Artificial ice was used and was stored in a special ice house at one side of the yard until it was needed. Service men were supplied with white uniforms and some used white rubber gloves. The ice was transferred to the cars on flat baggage trucks, and, when broken up, was carried into the coaches in galvanized iron pails.

Sanitary cans were provided at the rate of six per car, which included one per car for garbage. Old carbide cans were used, with a capacity of about 8 gallons, the dimensions being 12 inches in diameter by 19 inches in length. A can of this size could be easily handled by one man. A quarter inch round handle was attached to the sanitary can, and the top of the can was cut out so as to give a full opening. There were two styles of covers—one with a hole for the chute, which was attached to the bottom of each hopper, and the other a solid lid to be used while cans were being moved through the coach yard between the cars and the sewage-disposal shed. A solid lid was also used to cover the garbage cans.

In all, 3,000 sanitary cans were provided to supply the two Canadian National Railway yards and 2,400 pipe connections for these cans were also available.

Chutes were arranged with flanged collars so that covers would not slip off while a chute was suspended from a passenger car and the can removed. Chutes were fastened under each toilet hopper with fine iron wire as quickly as possible after the trains arrived.

Galvanized iron hopper connections were made to the sanitary sewer in three different locations in the yard for the dumping of soil cans. At each location two hoppers were installed in an inclosure, a removable screen being placed in each hopper. Two cans could be dumped at the same time, or, if the screen had to be removed from one hopper on account of being clogged, the other remained in service, thus insuring provision for the continuous discharge of sewage. It was found necessary to remove these screens at frequent intervals as they would otherwise have been choked up by bottles and other rubbish that was passed through the toilets on the Pullman cars.

It was usually necessary to empty the sanitary cans three times each day, although some of them required more frequent attention. After being emptied, the cans were sprayed on the inside with a disinfecting solution and then were covered with full-sized lids. While being moved through the coach yards the truck loads of sanitary cans were covered with tarpaulins. During the daytime hand trucks were used for distributing the sanitary cans, but after nightfall, when the coach yards were free from people, a gasoline power truck with two trailers was used, thereby speeding up the work.

A disinfecting solution was used around the cans under the cars and also in the buildings where the hopper sewer connections were located.

One hundred and six special shower baths were provided for men (10 for the use of railway employees) and 71 for women, the wash water from these shower baths being disposed of by discharge connections to a storm sewer. Both hot and cold water was available in these shower baths.

A layer of sand and gravel about 3 inches deep was laid in the main coach yard between the concrete platforms and the rails and was useful as an absorbant of water that was spilled or splashed.

Water from the kitchens of dining cars was a little more difficult to handle. It was partially taken care of by placing cans under some of the kitchen sinks, the cans being replaced as they became filled. In a special instance where a group of seven dining cars were close together a shallow hole was dug into which the water drained, being afterwards pumped to the nearest storm sewer through temporary pipe lines.

Both the Canadian Pacific and Canadian National Railways made special provision for handling the personal laundry of the delegates, and they also provided rest rooms, barber shops, beauty parlors, and telegraph and telephone facilities.

No undesirable odors were noticed throughout the yards at any time and very few flies were seen.

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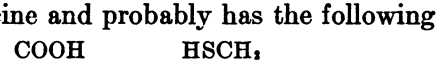
## THE CATALYTIC ACTION OF COPPER IN THE OXIDATION OF CRYSTALLINE GLUTATHIONE

By Carl Voegtlin, *Chief of Division of Pharmacology;* J. M. Johnson, *Senior Chemist;* and Sanford M. Rosenthal, *Senior Pharmacologist, National Institute of Health, United States Public Health Service*

The chemical isolation of *crystalline* glutathione from yeast and animal tissues by Hopkins (1929) and by Kendall, McKenzie, and Mason (1929) offers an opportunity to study under varying conditions the chemical and physiological conduct of this interesting cellular constituent. Glutathione is a tripeptide composed of glutamic acid, cysteine, and glycine and probably has the following constitution:



Like other sulphydryl compounds, glutathione is supposed to undergo, according to conditions, a reversible oxidation as follows:

In the case of cysteine it was formerly assumed that in aqueous solution of approximately pH 7, molecular oxygen converts cysteine into cystine, but Warburg and Sakuma (1923) clearly showed that this oxidation is conditioned by the presence of minute amounts of iron or copper salts. The conversion of cysteine to cystine by molecular oxygen is therefore no longer considered as an autoxidative process, but rather as a heavy metal catalysis. This view has gained favor from subsequent researches, particularly those of Michaelis (1929). The cysteine oxidation is catalyzed by iron, copper, and manganese, but not by nickel and cobalt salts.

Observation made with the *amorphous* impure SH glutathione, prepared by the original Hopkins method (1921) seemed to indicate that traces of iron or copper salts can function as catalysts in the conversion of the substance to its disulphide form. (Harrison, 1924.) However, Meldrum, and Dixon (1930) recently found that the *crystalline* glutathione prepared according to Hopkins (1929) behaved quite differently. They found the rate of oxygen uptake of crystalline glutathione, dissolved in phosphate buffer of pH 7.6, to be considerable lower than that of the amorphous product. They conclude, furthermore, that "whereas the addition of a trace of iron or copper salt greatly accelerates the uptake of oxygen by cysteine or impure glutathione, the oxidation of crystalline glutathione is not accelerated at all by the addition of iron or copper at pH 7.6 or by hematin in low concentrations. With larger amounts of hematin, however, a definite acceleration is produced, although the catalytic activity is still small compared with that observed with cysteine." By a rather involved series of experiments on the rate of oxidation of crystalline glutathione treated with a thermostable muscle powder or kaolin, they arrive at the conclusion that "the autoxidation of glutathione depends on the cooperation of two factors, present in traces as impurities in the glutathione preparations, namely, iron (or copper) and some substance able to form catalytically active complexes with metals. With crystalline glutathione the rate of oxidation is limited by the amount of the second factor present, and not by the iron."

In view of the importance of these conclusions we decided to submit the oxidation of crystalline glutathione to a reinvestigation.

## METHODS AND MATERIALS

The oxygen consumption was measured in the same Barcroft-Warburg microrespiration apparatus as used in our recent work on the oxygen consumption of tissues. The respiration vessels were provided with a side arm, which permitted the addition of solutions of chemicals to the solutions in the main compartments.[1] The final volume of fluid in the main compartments was in all experiments 2.6 c. c. All experiments were carried out at 37.6° C. Air used was as a source of oxygen. The respiration vessels, pipettes, and other glassware were freed from heavy metal impurities by treatment with chromic acid cleaning fluid, followed by thorough rinsing with water twice distilled in a pyrex-glass apparatus. This specially distilled water was also used for preparing the solutions of glutathione, cysteine, etc.

[1] The glutathione was placed in the main compartment and the metallic compounds and salts in the side arm. Unless otherwise stated the solutions in the side arm were added to the glutathione solutions a short time before the readings were begun. The total oxygen uptake was not ascertained by this procedure, because the object of the work was to study *rates* of oxidation as accurately as possible.

Several different lots of crystalline glutathione were prepared—samples A and B according to the Hopkins method; samples C and D by a slight modification of the Kendall method, using mercuric sulphate for the last precipitation with heavy metal salt. A few experiments were done with a sample of crystalline glutathione kindly supplied by Doctor Kendall. All of these samples had a uniform crystalline appearance, and their total nitrogen and total sulphur agreed fairly well with the values called for by theory. The cysteine hydrochloride was specially prepared by the Warburg method (1927), which yields a product free from all but infinitesimal amounts of catalytic metals. The kaolin which was used for the treatment of glutathione solutions was boiled several times with ordinary c.p. HCl, then with specially glass distilled HCl, and was finally washed free of acid with twice glass-distilled water. Hemin was prepared from oxblood by the glacial acetic method and recrystallized from pyridine-chloroform-glacial acetic. Part of this hemin was converted into protoporphyrin. (Fischer and Pützer, 1926.) The pH of the phosphate buffers of Clark was determined with the hydrogen electrode, that of the pyrophosphates by a carefully calibrated glass electrode. The hemin was converted into hematin solution by the addition of the necessary amount of a NaOH solution which had stood for a long time in order to remove catalytic metals. Warburg's (1927) recommendations were followed throughout the work in order to avoid the unintentional introduction of heavy metal impurities into the solutions.

The iron salts and hemin were analyzed for the presence of traces of copper. Considerable difficulties were met in this work, and only after testing several methods was it possible to obtain reliable results. The procedure finally adopted was the following: The ferric ammonium citrate and hemin were first *completely* oxidized by prolonged boiling with a mixture of copper free $H_2SO_4$ and $HNO_3$. The excess $HNO_3$ was then removed by boiling and the remainder was diluted with glass-distilled water. From here on the procedure was the same as that with the inorganic iron salts. The solutions were poured into an excess of glass-distilled $NH_4OH$. Under these conditions it was shown that the excess $NH_4OH$ prevents the precipitation or adsorption of the traces of copper. After some standing the ferric hydroxide was filtered off and washed with glass-distilled $NH_4OH$. The filtrate was concentrated by boiling and the copper was determined by the procedure of Elvehjem and Lindow (1929). One gram of substance contained the following amounts of copper in milligrams: Ferric chloride, 0.0017; ferrous ammonium sulphate (Mohr's salt), 0.013; ferric ammonium sulphate, 0.0009; ferric ammonium citrate, 0.0389; hemin (once recrystallized), 0.0165; and recrystallized five times, 0.0088.

RESULTS

*Effect of iron and copper salts.*—We have been able to confirm the findings of Meldrum and Dixon (1930) that the oxidation of crystalline SH glutathione is not catalyzed by iron salts. Various iron salts were employed, ferric chloride, ferrous ammonium sulphate, ferric ammonium sulphate, sodium ferric tartrate, and ferric ammonium citrate. Experiments were done in water, Locke's solution (pH 7.7), phosphate buffer (pH 7.5 to pH 8.24), and in pyrophosphate buffer. In no instance was there an effect on the oxidation of glutathione which could be ascribed to the added iron. When *large* amounts of some iron salts were used, a very slight effect on oxidation rate was noticed, but this could be ascribed to the traces of copper with which some of these iron salts were shown to be contaminated (see analytical results in preceding paragraph); for in the above experiments copper salts, similar to the iron salts, were also studied, and in every case a high degree of catalytic activity was present.

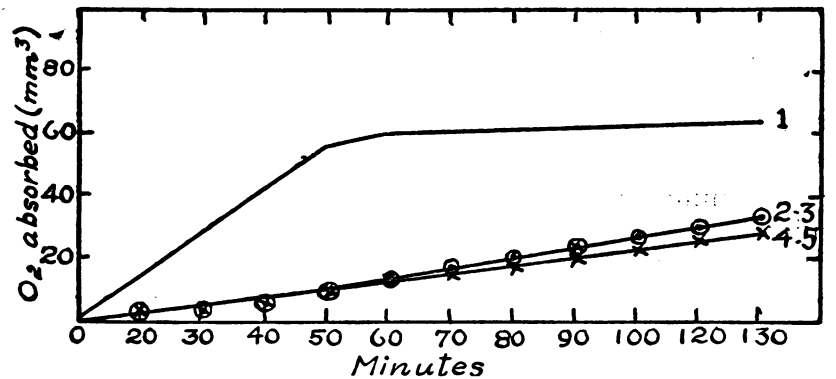



CHART 1.—The catalytic action of inorganic copper and the absence of effect of iron on the oxidation of 5 mg. glutathione C (Kendall) in Locke's solution, pH 7.7. Curve 1: Glutathione +0.001 mg. Cu (as $CuCl_2 2H_2O$). Curves 2, 3, and 4: Glutathione +0.01 mg., 0.002 mg., and 0.001 mg. Fe (as $FeCl_3.6H_2O$), respectively. Curve 5: Glutathione alone

The inorganic salts of iron or copper form relatively insoluble phosphates when added to alkaline phosphate buffer, and so Locke's solution (pH 7.7) was employed to study the effect of cupric and ferric chloride. In Chart 1 it is seen that 0.001 mg. of copper as cupric chloride caused a rapid oxidation of glutathione, while 0.01 to 0.001 mg. of iron as ferric chloride had little or no effect on the oxidation rate of 5 mg. of glutathione C.

The citrates and tartrates of iron and copper are not easily precipitated from slightly alkaline solutions, and so these salts were employed to study the effect of iron and copper on glutathione in phosphate buffers. In a phosphate buffer of pH 7.5, 0.001 mg. of copper as sodium cupric citrate had a marked catalytic action, while 0.01 mg.

of iron as ferric ammonium citrate was without effect on the oxidation of glutathione D (Chart 2).

Advantage was next taken of the observation of Meldrum and Dixon (1930) that kaolin would remove traces of catalytically active metals from a solution of crystalline glutathione, and so the kaolin

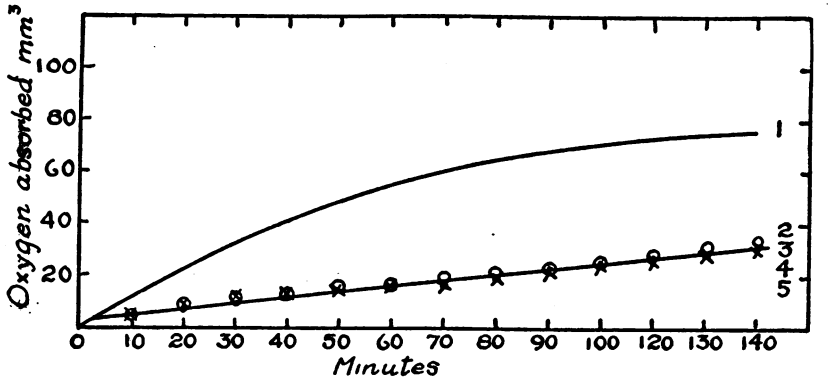



CHART 2.—The effect of copper and the absence of effect of iron citrate on 5 mg. glutathione D (Kendall) in phosphate buffer, pH 7.5. Curve 1: Glutathione +0.001 mg. Cu (as sodium cupric citrate). Curves 2, 3, and 4: Glutathione +0.01 mg., 0.002 mg., and 0.001 mg. Fe (as ferric ammonium citrate), respectively. Curve 5: Glutathione alone

treated product became "stabilized" and did not undergo oxidation, unless a heavy metal catalyst was supplied. Meldrum and Dixon concluded from their observations that the traces of cysteine alleged to be present in crystalline glutathione are not removed by kaolin treatment, and therefore that the metal-cysteine complex could be

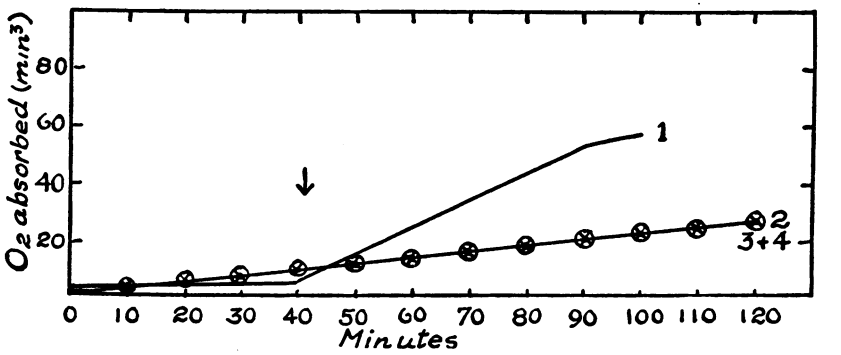



CHART 3.—The absence of effect of 0.05 mg. hematin with or without 0.1 mg. cysteine on the oxidation of 5 mg. glutathione in phosphate buffer pH 7.5. Curve 1: 2 mg. cysteine. Curve 2: Glutathione A (Hopkins). Curve 3: Glutathione A (Hopkins) +0.1 mg. cysteine. Curve 4: Glutathione C (Kendall) +0.1 mg. cysteine. 0.05 mg. hematin added to all vessels at time indicated by arrow

reformed when iron or copper is added to the kaolin-treated glutathione. In our initial experiments it was found that the addition of *small* amounts of hematin or sodium ferric tartrate along with *small* amounts of pure cysteine to glutathione did not accelerate the rate of oxidation of the latter substance. (Chart 3.) This, according to

Meldrum and Dixon, might be due to an optimum amount of iron being already present, so that further additions were ineffective. Experiments were accordingly carried out with kaolin-treated glutathione,[2] in which the ability to take up oxygen had been reduced to a negligible degree. We were unable to confirm the observation of Meldrum and Dixon that iron salts are capable of appreciably increasing the oxygen uptake of such a glutathione preparation. On the other hand, the catalytic action of copper salts was very pronounced. In Chart 4A is shown the negligible effect of 0.1 mg. of iron as ferric ammonium citrate, the absence of effect of 0.01 mg. of iron as ferrous ammonium sulphate, and the pronounced catalytic action of 0.0001 mg. of copper as sodium cupric citrate. In this experiment glutathione C, prepared according to Doctor Kendall's technique, was em-

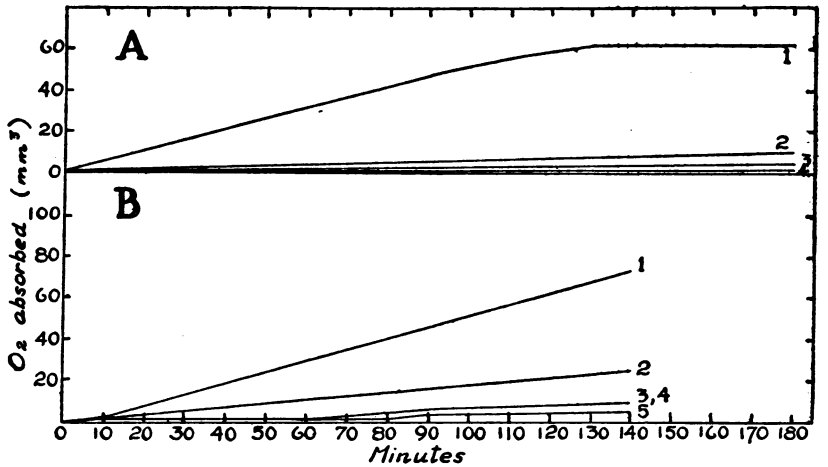



CHART 4.—A. The activity of copper salts and lack of effect of iron salts on 5 mg. glutathione C (Kendall) which had been freed from heavy metals by kaolin treatment. Phosphate buffer, pH 7.5. Curve 1: Glutathione +0.0001 mg. Cu (as sodium cupric citrate). Curve 2: Glutathione +0.1 mg. Fe (as ferric ammonium citrate). Curve 3: Glutathione alone. Curve 4: Glutathione +0.01 mg. Fe (as ferrous ammonium sulphate)

B. Similar results obtained with a sample of glutathione supplied by Doctor Kendall. Curve 1: 5 mg. kaolin-treated glutathione +0.0001 mg. Cu. Curve 2: Glutathione (without kaolin treatment) alone. Curve 5: Kaolin-treated glutathione alone. Curves 3 and 4: Kaolin-treated glutathione +0.02 mg. Fe (as ferric ammonium citrate) and glutathione +0.01 mg. Fe (as ferrous ammonium sulphate). All experiments in phosphate buffer, pH 7.5.

ployed. Similar results were obtained upon a sample of glutathione prepared in Doctor Kendall's laboratory, as is shown in Chart 4B.

## EFFECT OF HEMATIN

Hematin behaved differently from the iron salts studied. We obtained results similar to those of Meldrum and Dixon, who found that small amounts (0.05 mg.) of hematin did not accelerate the oxidation of glutathione, while larger amounts (0.5 mg.) had a pro-

[2] The glutathione was dissolved in phosphate buffer, the kaolin was added, and the mixture was shaken for a few minutes. The kaolin was then removed by centrifugation.

nounced effect. (Charts 3 and 5.) The absence of catalytic action of small amounts of hematin was not affected by the addition of 0.1 mg. of cysteine to the glutathione solution. This clearly indicates, as with the iron salts, that the oxidation of crystalline glutathione is not necessarily dependent on the presence of a metal-cysteine complex.

At first it was believed that the action of large amounts of hematin was due to its copper content. Chemical analysis of the sample showed it to contain about 0.017 mg. copper per gram. An attempt was made to obtain copper-free hemin, but without success. After five recrystallizations from pyridine, chloroform, and glacial acetic, the copper content was 0.0088 mg. per gram of hemin. However, further investigation revealed that the action of hematin depends on the structure of the compound and can not be explained on a basis of inorganic copper content. This was shown in the following manner:

Warburg (1927) had found that the catalytic activity of iron salts on cysteine was inhibited in the presence of pyrophosphate, while

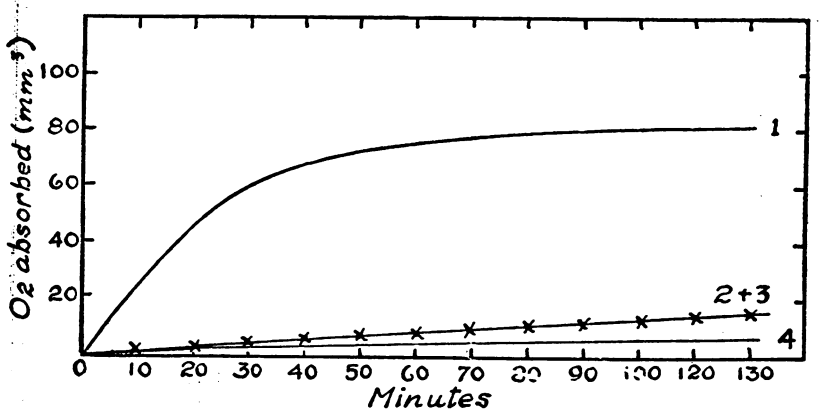



CHART 5.—The catalytic effect of a large amount of hematin on 5 mg. glutathione B (Hopkins), kaolin-treated. Curve 1: Glutathione +0.5 mg. hematin. Curves 2 and 3: Glutathione +0.05 mg. hematin and glutathione +0.05 mg. hemin +0.1 mg. cysteine. Curve 4: Glutathione alone. All experiments in phosphate buffer, pH 7.5

copper catalysis proceeded with a high coefficient of activity. Warburg (1927) evolved a method for the estimation of minute amounts of copper based upon this principle. Elvehjem (1930) extended these observations and studied the effects of pH, temperature, and concentration of solutes on the reaction. These investigators did not employ hematin in their studies, and assumed that all iron compounds were inactive on cysteine in pyrophosphate solutions.

When we employed this cysteine oxidation method to estimate the copper content of hematin, it was found that hematin retains its activity on cysteine oxidation in pyrophosphate buffer. The extent of activity is somewhat less than in phosphate buffer and the rate does not proceed as a linear function, but proceeds with decreasing velocity as a function of time.

Since hematin retains its accelerating action on the oxidation of cysteine in pyrophosphate as well as phosphate buffer, it was necessary to prove that this activity was not due to the traces of copper which it contained. In Chart 6B is shown the effect of hematin on the oxidation of cysteine in pyrophosphate buffer. When the hemin iron is reduced to inorganic iron by ashing the hemin, this effect is almost completely abolished. Ten mg. of hemin in a covered quartz crucible were completely ashed in an electric oven at 600° C. for four

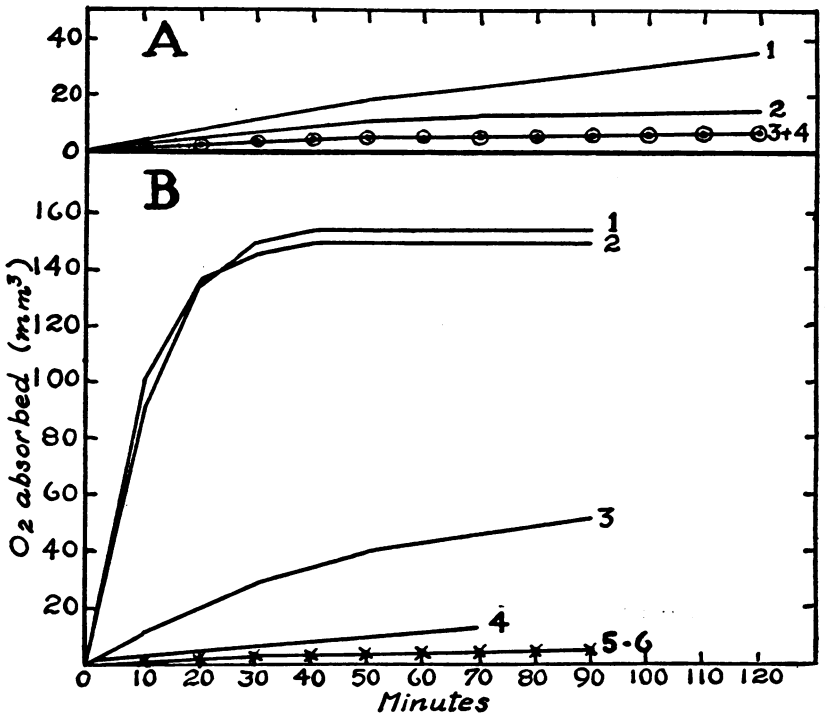



CHART 6.—A. The effect of hemin ash on cysteine oxidation in M/5 pyrophosphate, pH 7.67. The hemin was ashed at 600° C. for four hours. Curve 1: 6 mg. cysteine HCl + ash of 0.5 mg. hemin +0.0001 mg. Cu (as sulphate). Curve 2: 6 mg. cysteine HCl + ash of 0.5 mg. hemin. Curve 3: 6 mg. cysteine HCl + acid extract of empty quartz vessel used as control. Curve 4: 6 mg. cysteine HCl alone. By comparison of the effect of hemin ash with that of the copper, 0.5 mg. hemin contains 0.000075 mg. Cu.

B. The effect of hematin and protoporphyrin on cysteine oxidation in pyrophosphate, pH 7.67. Curve 1: 6 mg. cysteine HCl +0.5 mg. hematin +0.0001 mg. Cu. Curve 2: 6 mg. cysteine HCl +0.5 mg. hematin. Curve 3: 6 mg. cysteine HCl +0.05 mg. hematin. Curve 4: 6 mg. cysteine HCl +0.5 mg. protoporphyrin. Curve 5: 6 mg. cysteine HCl +0.005 mg. Fe (as ferric ammonium citrate). Curve 6: 6 mg. cysteine HCl alone

hours. The residue was dissolved in glass-distilled normal hydrochloric acid by heating over a water bath for one hour. The effect of the hemin ash on cysteine in pyrophosphate is shown in Chart 6A. This residual effect is presumably due to the traces of copper which hemin contained. By comparing this effect with that of $1 \times 10^{-4}$ mg. of copper, after the technique of Warburg, it was calculated that the hemin contained approximately 0.075 mg. of copper per gram. The

error in this method is probably large, because of the great excess of iron present.[3] This value is considerably higher than that obtained by the Biazzo method.

The fact that complete ashing of hemin destroys its accelerating action on the oxidation of cysteine in pyrophosphate demonstrates that the action of hemin is dependent on its intact structure. Another possibility is that the traces of copper in hematin are present as an extremely active catalytic organic complex, which is destroyed by ashing. Further evidence was obtained, however, to support the

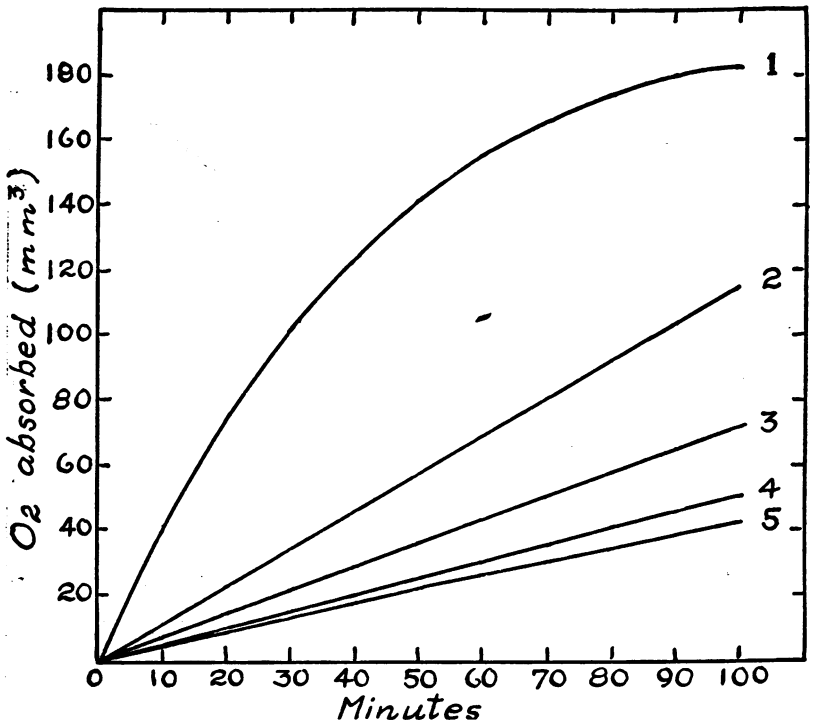



CHART 7.—The effect of recystallized hemin (0.5 mg.) and of hemin ash on the oxidation of 15 mg. glutathione C (Kendall) in pyrophosphate, pH 7.63. Curve 1: Glutathione +0.5 mg. hematin. Curve 2: Glutathione +ash of 0.5 mg. hemin +0.0001 mg. Cu. Curve 3: Glutathione +ash of 0.5 mg. hemin. Curve 4: Glutathione alone. Curve 5: Glutathione +0.05 mg. hematin (unashed). By comparison of effects of hemin ash with that of copper, 0.5 mg. hemin contains 0.00006 mg. Cu.

belief that the hematin effect in pyrophosphate is dependent upon the iron as it occurs in the hematin molecule. Experiments done under identical conditions with protoporphyrin showed very little effect on the oxidation of cysteine in pyrophosphate. The effect was of the same order of magnitude as that produced by the hemin ash, and could be explained by the trace of copper contained in the protoporphyrin. (Chart 6B.)

[3] The Warburg method is not reliable for the quantitative estimation of copper in the presence of proportionately large amounts of iron.

Glutathione is affected by hematin in *pyrophosphate* in a manner similar to the effect obtained in phosphate buffer. Large amounts of hematin (0.5 mg.) accelerate oxidation, while smaller amounts (0.05 mg.) are ineffective. This is shown in Chart 7, where it is also seen that the ash of 0.5 mg. hemin retains only a small fraction of the activity of the unashed compound. When the activity of the hemin ash on glutathione is compared with that of a known quantity of added copper, it is observed that the copper content of the hemin

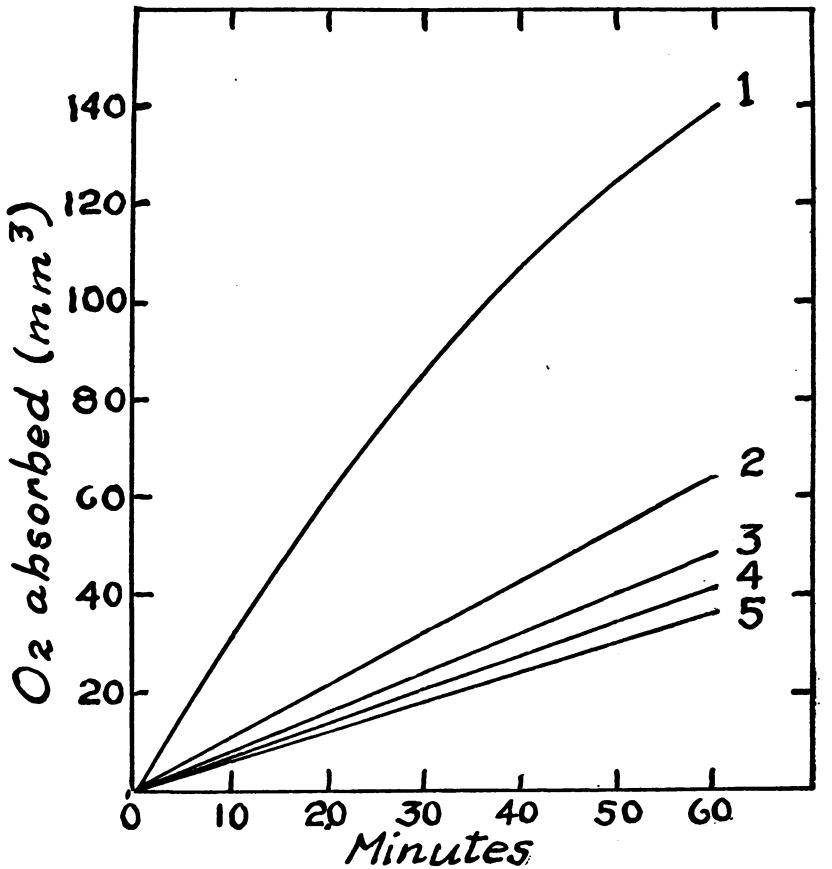



CHART 8.—The effect of varying amounts of hematin and of hemin ash on the oxidation of 15 mg. glutathione C (Kendall) in pyrophosphate, pH 7.63. Curve 1: Glutathione +0.5 mg. hematin. Curve 2: Glutathione +0.25 mg. hematin. Curve 3: Glutathione +ash of 0.5 mg. hemin. Curve 4: Glutathione alone. Curve 5: Glutathione +0.1 mg. hematin.

ash is 0.06 mg. of copper per gram hemin, which is in agreement with the figure obtained by the cysteine method. We have shown in other experiments, which will not be described here, that iron salts do not affect the oxidation of glutathione in pyrophosphate buffer.

To determine at what concentration of hematin the effect becomes manifest, varying concentrations were added to glutathione in pyrophosphate buffer. The results are shown in Charts 7 and 8. Accel-

eration of oxidation begins between concentrations of 0.1 mg. and 0.25 mg. of hematin in the glutathione solutions of 2.6 c. c. volume; 0.1 mg. and 0.05 mg. of hematin seem to produce a very slight inhibition of oxidation in contrast to the accelerating effect of larger amounts. These results are shown graphically in Chart 9, where the effect of varying amounts of hematin on the oxidation of glutathione is plotted

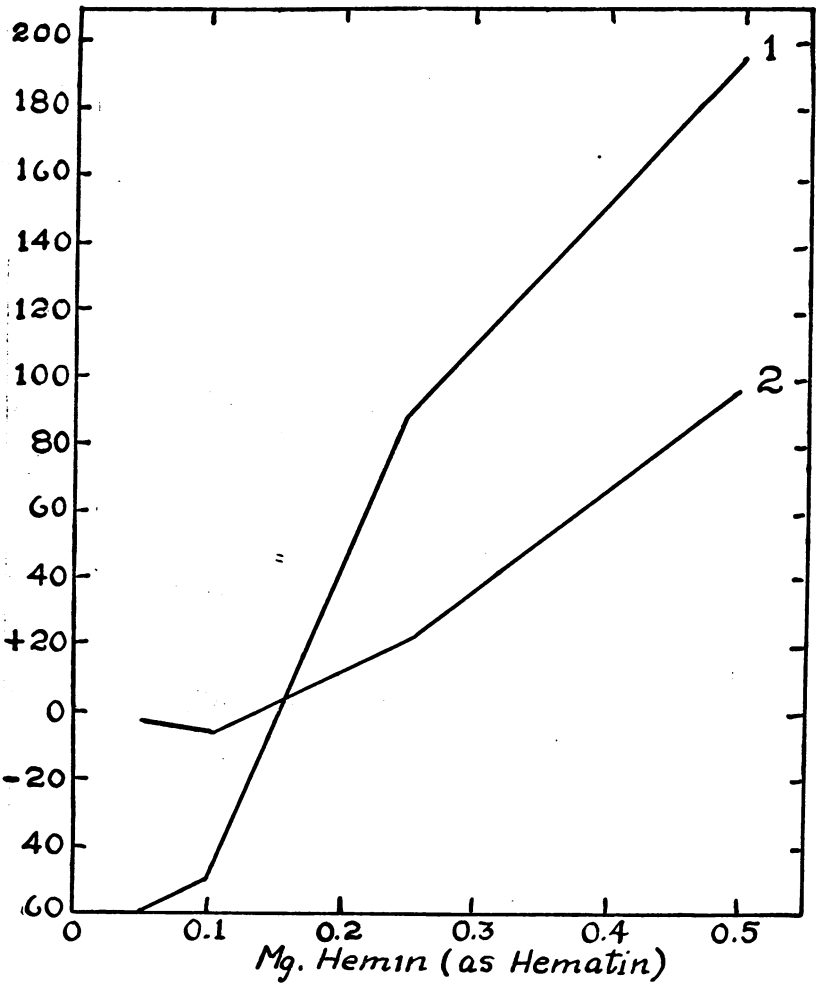



CHART 9.—The activity of various amounts of hematin on 15 mg. glutathione in M/5 pyrophosphate, pH 7.63. Curve 1 represents Warburg's coefficient $\frac{\text{mm.}^3 \text{ of } O^2}{\text{mg. hematin} \times \text{hours}}$, produced by the hematin. In Curve 2 the oxygen consumption (mm.$^3$) for the first hour is plotted against increasing amounts of hematin

in terms of mm.$^3$ increase or decrease of oxygen consumption per hour and as the activity coefficient. (Warburg's "Wirkungs Koefficient.")

*The activity of hematin is relatively feeble as compared to copper.*—The following values will illustrate the approximate activity of copper and of hematin in M/5 pyrophosphate on cysteine and glutathione:

*Catalysis of 6 mg. cysteine hydrochloride in pyrophosphate at pH 7.67*

| | Catalytic coefficient |
|---|---|
| 0.5 mg. hemin (as hematin) | 12, 000 |
| 0.005 mg. hemin (as hematin) | 9, 000 |
| 0.0001 mg. Cu. (as copper ammonium sulphate) | 195, 000 |

*Catalysis of 15 mg. glutathione in pyrophosphate at pH 7.63*

| | |
|---|---|
| 0.5 mg. hemin (as hematin) | 200 |
| 0.05 mg. hemin (as hematin) | 0 |
| 0.0001 mg. Cu | 320, 000 |

*Effect of pH on copper catalysis of glutathione.*—Warburg (1927) showed that the copper catalysis of cysteine in pyrophosphate has an optimum of activity at approximately pH 7.6. Elvehjem (1930)

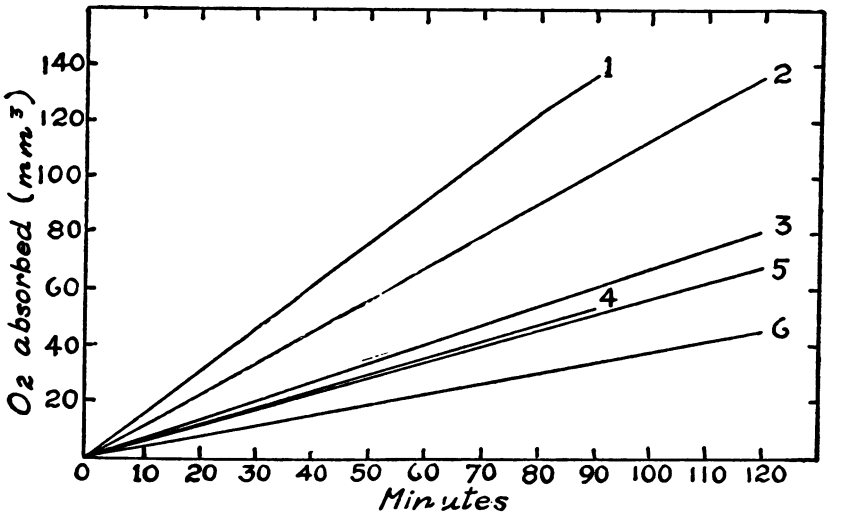



CHART 10.—The effect of pH on the activity of copper as a catalyst of glutathione B (Hopkins). In all experiments 15 mg. of glutathione and 0.0001 mg. of Cu (as cupric ammonium sulphate) in M/5 pyrophosphate were employed. Curves 1 and 4: Glutathione with and without Cu at pH 7.68. Curves 2 and 5: Glutathione with and without Cu at pH 7.1. Curves 3 and 6: Glutathione with and without Cu at pH 6.6

extended these observations and concluded that the decrease in activity on the alkaline side is due to the formation of insoluble copper salts, while the decrease on the acid side is due to the formation of an inactive copper-cysteine complex.

The copper catalysis of glutathione in M/5 pyrophosphate behaves similarly to that of cysteine. There is a decrease in activity below pH 7.7. This is represented in Chart 10, where the oxygen uptake of 15 mg. glutathione B (Hopkins) is shown at various hydrogen-ion concentrations with and without the addition of 0.0002 mg. of copper

(as cupric ammonium sulphate). Calculated in terms of Warburg's coefficient $\frac{\text{mm.}^3O_2}{\text{mg. Cu.} \times \text{hours}}$, the following values are obtained, with Warburg's results with cysteine given for comparison:

| Copper catalysis of glutathione | | Copper catalysis of cysteine (after Warburg) | |
|---|---|---|---|
| pH | Coefficient | pH | Coefficient |
| 7.68 | 320,000 | 8.03 | 482,000 |
| 7.1 | 125,000 | 7.63 | 900,000 |
| 6.6 | 85,000 | 7.15 | 416,000 |

*The "autoxidation" of crystalline glutathione.*—As stated in the introductory remarks, the "autoxidation" of cysteine has been shown to be due to the presence of traces of certain heavy metals; and when these metals are eliminated, as far as this is possible, the rate of oxygen uptake of cysteine solutions sinks to a very low level. The solutions of crystalline glutathione which we have employed take up oxygen at a rate greater than that of purified cysteine, and it appears from our preceding experiments that there should be present in the glutathione crystals appreciable traces of copper or some metal other than iron, capable of catalyzing the oxidation of glutathione. Analysis of the ash of glutathione verified this assumption.

One hundred mg. of crystalline glutathione B (Hopkins) was ashed in an electric furnace in a covered quartz crucible at 600° C. for three hours. An empty quartz crucible was similarly treated as a control. One c. c. of glass-redistilled normal hydrochloric acid was added to each crucible and allowed to stand for 30 minutes. Four respiration vessels were set up as follows:

*Main vessel*

| | | | |
|---|---|---|---|
| 2 c. c. Pyrophosphate.<br>0.1 c. c. N/1 NaOH.<br>0.1 c. c. $H_2O$. | 2 c. c. Pyrophosphate.<br>0.1 c. c. N/1 NaOH.<br>0.1 c. c. $H_2O$. | 2 c. c. Pyrophosphate.<br>0.1 c. c. N/1 NaOH. | 2 c. c. Pyrophosphate.<br>0.1 c. c. N/1 NaOH. |

*Side arm*

| | | | |
|---|---|---|---|
| 0.3 c. c. cysteine HCl (6 mg.).<br>0.1 c. c. N/1 HCl. | 6 mg. cysteine HCl.<br>0.1 c. c. GSH ash. | 6 mg. cysteine HCl.<br>0.1 c. c. GSH ash.<br>0.1 c. c. Cu=$1\times10^{-4}$ mg. | 6 mg. cysteine HCl.<br>0.1 c. c. control ash. |

The reaction of the pyrophosphate was so adjusted that after the addition of the acid cysteine solution from the side arm the pH was 7.67. The pH determinations were made with the glass electrode. A fifth vessel with pyrophosphate was used as a thermobarometer. The vessels were shaken in a water bath until equilibrium was reached. The solutions from the side arms were then emptied into the main vessels and after a few minutes of shaking the cocks were closed and readings were begun.

The results are shown in Chart 11. From these results the copper content of this preparation of glutathione was estimated to be 0.013 mg. of copper per gram of glutathione. It was also found that the ash of 10 mg. of glutathione caused a considerable increase in oxygen consumption of the 15 mg. of glutathione to which it was added, in pyrophosphate buffer. (Chart 12.) These experiments indicate that the samples of crystalline glutathione made by us by the Hopkins procedure contain traces of copper.

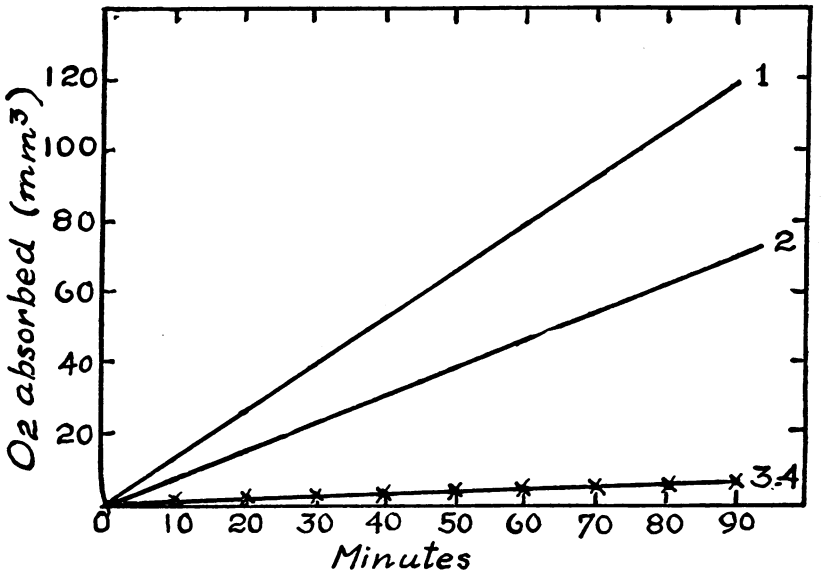



CHART 11.—The estimation of copper in glutathione B (Hopkins) by the cysteine method of Warburg, in M/5 pyrophosphate, pH 7.67. Curve 1: 6 mg. cysteine HCl+ash of 10 mg. glutathione +0.0001 mg. Cu. Curve 2: Cysteine HCl+ash of 10 mg. glutathione. Curve 3: Cysteine HCl+ control ash (empty quartz vessel). Curve 4: Cysteine HCl alone. *Conclusion:* 10 mg. glutathione contains 0.00013 mg. Cu

In order to determine the reliability of the cysteine method for copper analysis the effects were determined of various concentrations of copper on the velocity of cysteine oxidation in M/5 pyrophosphate buffer. Warburg found that at pH 7.6, when concentrations of copper up to $2\times10^{-4}$ mg. were employed (these are the limitations within which we have worked), there was a direct proportionality between the amount of copper present and the rate of oxidation. Elvehjem (1930) found that by employing M/100 pyrophosphate in M/15 phosphate buffer at pH 8.0 accurate determinations could be made up to $4\times10^{-4}$ mg. copper.

In Chart 13B is shown the effect of various copper concentrations on the rate of oxidation of 6 mg. of cysteine (hydrochloride) in M/5 pyrophosphate. In Chart 13A the results of three such experiments are plotted in terms of relative increases in rate with increasing copper concentrations. The increase resulting from the lowest amount of copper was taken as 100 per cent. It is seen that up to $2\times10^{-4}$ mg. of copper there is a roughly direct proportionality, but when greater concentrations of copper are used the rate of oxidation increases out of proportion to the copper concentration. This is interesting in view of the experiments of Elliott (1930), who studied the effect of

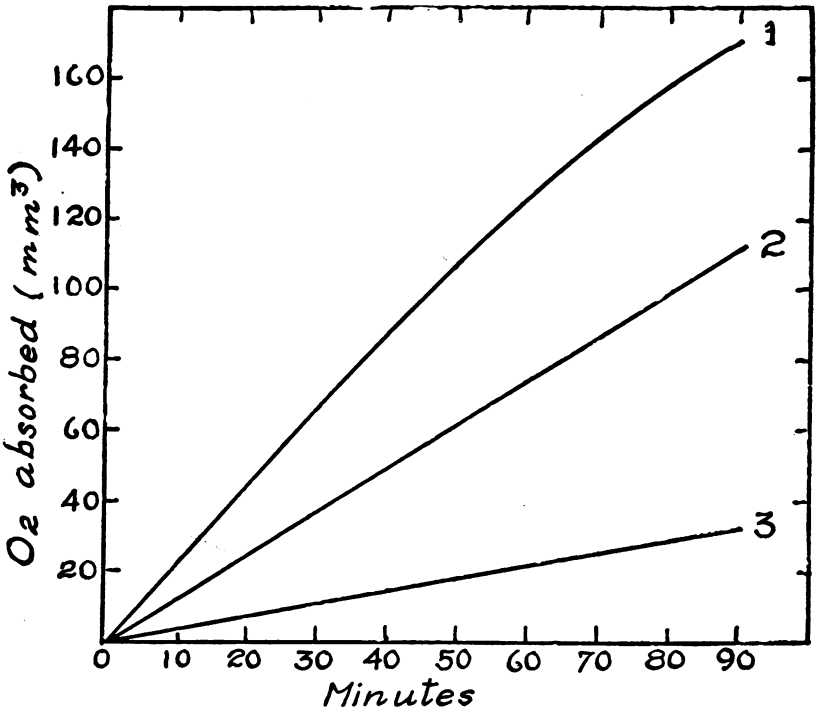



CHART 12.—The effect of glutathione ash on the oxidation of 15 mg. glutathione B (Hopkins) in pyrophosphate pH 7.68. Curve 1: Glutathione+ash of 10 mg. glutathione+0.0002 mg. Cu. Curve 2: Glutathione+ash of 10 mg. glutathione. Curve 3: Glutathione alone

concentration of copper on cysteine oxidation in unbuffered solutions at pH 7.3. He began with $6.4\times10^{-4}$ mg. of copper in 3 c. c. of solution containing 8 mg. of cysteine. As the concentration of copper was increased above this amount there was a relative decrease in catalytic activity instead of an increase, as we have found with the lower concentrations of copper in pyrophosphate. These relationships are apparently dependent upon the ratio of cysteine concentration to that of copper, for in an experiment where the concentration of cysteine was varied, Elliott obtained results similar to ours when the ratio of

cysteine to copper approached a multiple (×3) of the ratios which we employed.

Glutathione behaves differently from cysteine in regard to the velocity of oxygen uptake in the presence of varying amounts of copper. Under conditions identical to those used with cysteine, the

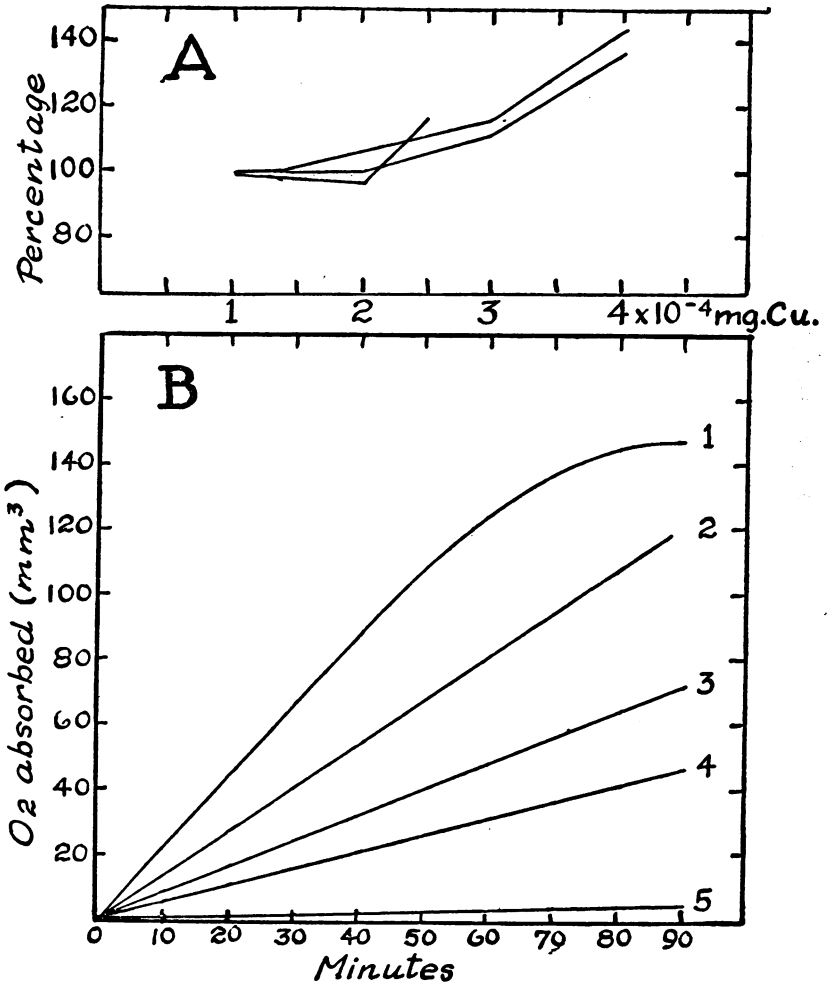



CHART 13.—B. The relation of concentration of Cu to velocity of oxidation of cysteine. Six mg. cysteine HCl in M/5 pyrophosphate pH 7.67. Curve 1: $4\times10^{-4}$ mg. Cu. Curve 2: $3\times10^{-4}$ mg. Cu. Curve 3: $2\times10^{-4}$ mg. Cu. Curve 4: $1.4\times10^{-4}$ mg. Cu. Curve 5: Cysteine alone. In part A of the chart the results of three such experiments are plotted in terms of relative effect, the increase in $O_2$ uptake of smallest amount of copper being taken as 100 per cent

proportionality between copper concentration and oxygen uptake is, as with cysteine, approximately linear below copper concentrations of $2\times10^{-4}$ mg.; but with larger amounts of copper there is a falling off of catalytic activity instead of an increase as with cysteine. These

observations are shown in Chart 14B, and the results of three such experiments, plotted in terms of the relative effect of various copper concentrations, are shown in Chart 14A.

## DISCUSSION

In agreement with Meldrum and Dixon (1930) we find that crystalline glutathione, dissolved in phosphate buffer of pH 7.6 absorbs

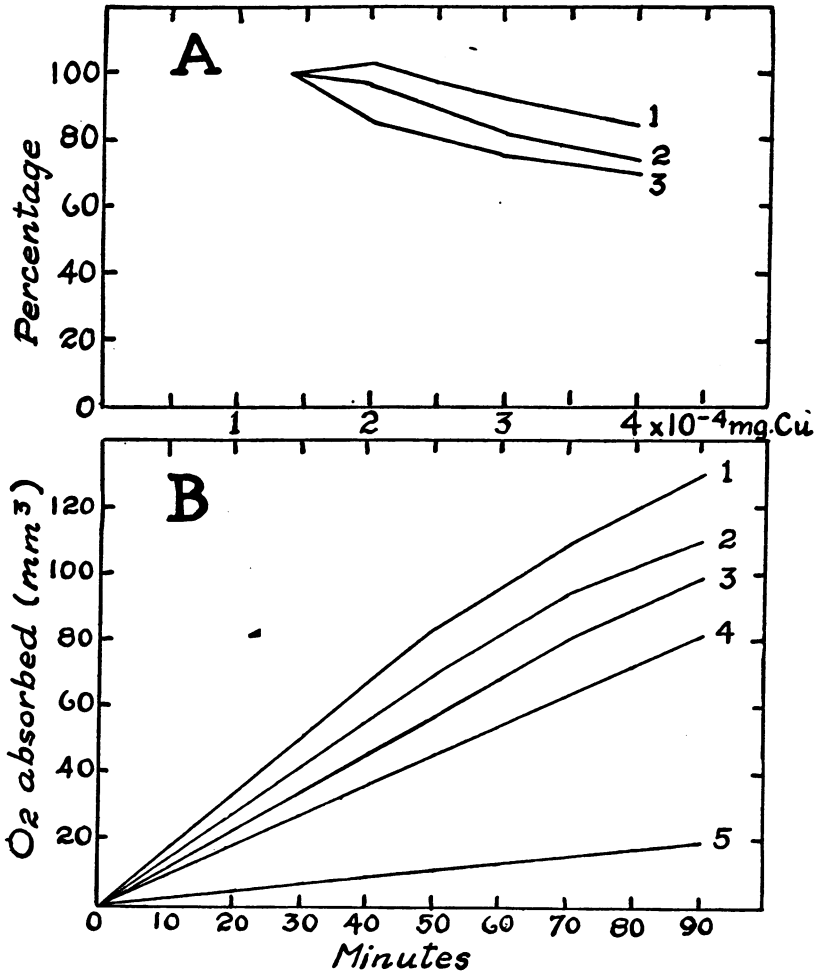



CHART 14.—B. The relation of concentration of copper to the velocity of oxidation of glutathione. Fifteen mg. glutathione B (Hopkins) in pyrophosphate, pH 7.6. Curve 1: $4\times10^{-4}$ mg. Cu. Curve 2: $3\times10^{-4}$ mg. Cu. Curve 3: $2\times10^{-4}$ mg. Cu. Curve 4: $1.4\times10^{-4}$ mg. Cu. Curve 5: Glutathione alone. In part A of the chart the results of three such experiments are plotted in terms of relative effect

oxygen at a slow rate. Working at 20° C. they state that 5 mg. of glutathione consumes about 30 mm.³ per hour. In our experiments, carried out at 37.6° C. in phosphate of pH 7.6, we find even a lower oxygen uptake. We also confirm the observations of Meldrum and

Dixon, that treatment of glutathione solutions with purified kaolin causes a decrease in the rate of oxygen consumption. This may be due to the removal of traces of catalytic metals by the kaolin.

We also confirm the observations of Meldrum and Dixon that the addition of various iron salts to glutathione solutions does not increase the rate of oxidation. But we are unable to confirm the accelerating action on oxygen uptake of the addition of iron to kaolin-treated crystalline glutathione solutions.

Our observations on the action of hematin are also in harmony with Meldrum and Dixon's findings and indicate a low order of activity of this substance in the oxidation of glutathione.

The principal and important discrepancy between our findings and those of Meldrum and Dixon concerns the action of copper salts. They state that copper is catalytically *inactive*. We find that copper in very low concentrations exerts a powerful catalytic effect on solutions of crystalline glutathione dissolved in phosphate or pyrophosphate buffer or Locke's solution, within the physiological pH range. This catalytic action is also present in glutathione solutions which have been treated with kaolin.

In view of this discrepancy between our results and those of Meldrum and Dixon, it is necessary to consider the possibility that this is due to differences in the glutathione employed. We have attempted to control this source of variation by employing several samples of glutathione prepared both by the method of Hopkins and that of Kendall and by employing a preparation made in Kendall's laboratory, all of which gave similar results. It is of interest also that none of our preparations, when tested with the Sullivan reaction as recently described by Sullivan and Hess (1931), gave any evidence of the presence of cysteine or other impurities reacting with the naphthoquinone reagent.

We furthermore present evidence indicating that crystalline glutathione, prepared by strictly following the method of Hopkins, contains sufficient traces of copper to explain the so-called autoxidation on the basis of a copper catalysis.

Finally, we have shown that the addition of small amounts of *pure* cysteine does not accelerate the rate of oxidation of crystalline glutathione. In a subsequent paper we shall present further evidence concerning the specificity of copper as a catalyst and a description of methods for the preparation of glutathione which shows an exceedingly small oxygen uptake.

In conclusion we can state that these purely chemical results may possibly have a biological bearing. Glutathione and copper both occur normally in various tissues in small amounts, but their physiological function is still more or less obscure. The work of Hart, Steenbock, Waddell and Elvehjem (1928) has shown that traces of

copper in the diet, in contrast to other heavy metals, are highly effective in the prevention and cure of nutritional anemia of rats. Glutathione seems to be concerned in some phase of the complex biological oxidation-reduction process, and also appears to play the rôle of activator of certain proteolytic enzymes (Waldschmidt-Leitz (1930) and Grassmann, Schoenebeck and Eibeler (1931)).

Our present observations suggest perhaps that there is a physiological relationship between glutathione and copper. The ability of blood serum and of egg white rapidly to oxidize crystalline glutathione (Rosenthal and Voegtlin, 1931) can be explained on a basis of their copper content. On the other hand, we found that some tissues with a high copper content, as liver, are able under physiological conditions to keep added glutathione in the reduced state. Some years ago Voegtlin, Johnson, and Dyer (1925) showed that albino rats survive a minimum lethal dose of sodium cupri tartrate if the animals receive a preceding intravenous dose of reduced glutathione in the ratio of 10 moles of glutathione to 1 atom of copper. We have recently confirmed these results by using highly purified crystalline glutathione. The anemia and loss of body weight produced by sublethal doses of copper can also be prevented by glutathione.

## CONCLUSIONS

1. Crystalline glutathione, prepared according to the method of Hopkins or that of Kendall, is susceptible to oxidation catalysis by traces of copper salts.

2. Iron salts, under the same conditions, do not exert a catalytic action on the oxidation of crystalline glutathione.

3. The rate of oxidation of glutathione is not accelerated by the addition of *small* amounts of hematin. Larger amounts of hematin increase the rate of oxidation, but this effect is of a low order of magnitude when compared with that of copper. After repeated recrystallization, hemin still contains minute amounts of copper, but the action of hematin, made from this hemin, does not appear to be due to this copper, but rather to the intact structure of hematin. This is shown by complete ashing of the hemin and adding the dissolved ash to the glutathione solution. This practically abolishes the action. Furthermore, protoporphyrin, prepared from the same lot of hemin, when added to glutathione is practically inactive. The acceleration of the oxidation of glutathione and of cysteine by large amounts of hematin occurs in pyrophosphate buffer solutions. In this respect also hematin differs in behavior from iron salts.

4. The so-called autoxidation of crystalline glutathione is dependent upon the presence of traces of a heavy metal in the crystalline product. The minute amount of ash obtained by complete combustion of crystalline glutathione, when analyzed for copper by the Warburg

method, evidently contains sufficient copper to account for the relatively low rate of oxygen uptake of solutions of crystalline glutathione.

5. We were unable to demonstrate that the oxidation of crystalline glutathione is dependent on the presence of small amounts of cysteine.

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## DEATH RATES IN A GROUP OF INSURED PERSONS

### Rates for Principal Causes of Death for July, 1931

The accompanying table, taken from the Statistical Bulletin for August, 1931, issued by the Metropolitan Life Insurance Co., presents the mortality record of the industrial insurance department of the company for July as compared with that for the preceding month and for the corresponding month of last year. It also gives the cumulative rates for the period January–July of the years 1930 and 1931. The rates are based on a strength of approximately 19,000,000 insured persons in the United States and Canada. In recent years the general death rate in this more or less selected group of persons has averaged about 72 per cent of the rate for the registration area of the United States.

In spite of the economic depression, health conditions have been excellent so far this year in this group of industrial policyholders, which consists of persons most likely to be affected by economic disturbances.

The Bulletin states:

July was the fourth successive month this year to register a lower death rate than that for the corresponding month of 1930. This low mortality since the

beginning of the second quarter has affected the cumulative death rate for the year so favorably that at the end of July it stands only 1.1 per cent above the figure for the corresponding part of last year. At the end of the first quarter the cumulative mortality rate was 5.1 per cent above that for the like period of 1930.

Except for the influenza outbreak of last winter, the present high prevalente of acute poliomyelitis, a considerable increase in deaths from diabetes, and an indicated rise of unusual proportions in the cancer mortality rate, there are no real bad spots in the 1931 health record to date. The mortality has been low for all of the principal epidemic diseases of childhood, particularly diphtheria; the tuberculosis death rate is 7 per cent below the previous minimum, registered only last year; the rates for diarrheal complaints and puerperal conditions are running lower than ever before. The small increases that appear for heart diseases and cerebral hemorrhage reflect largely the effect of last winter's influenza outbreak, which undoubtedly hastened the deaths of many persons suffering from chronic diseases.

As for deaths due to violence, the rates for suicide and homicide have increased slightly, and that for automobile accidents appreciably. For all accidents combined, however, a slight decline is in evidence, as compared with the January–July period of 1930.

*Death rates (annual basis) per 100,000 for principal causes of death*

[Industrial insurance department, Metropolitan Life Insurance Co.]

| Cause of death | Rate per 100,000 lives exposed * | | | | |
|---|---|---|---|---|---|
| | July, 1931 | June, 1931 | July, 1930 | Cumulative January to July | |
| | | | | 1931 | 1930 |
| Total, all causes | 831.7 | 835.1 | 854.6 | 934.8 | 924.4 |
| Typhoid fever | 1.7 | 1.9 | 2.6 | 1.3 | 1.5 |
| Measles | 3.2 | 5.5 | 2.3 | 4.7 | 4.4 |
| Scarlet fever | 2.6 | 3.7 | 1.8 | 3.8 | 3.2 |
| Whooping cough | 2.7 | 3.2 | 5.0 | 3.5 | 4.7 |
| Diphtheria | 3.0 | 3.3 | 4.3 | 4.4 | 6.8 |
| Influenza | 4.9 | 8.9 | 4.3 | 29.9 | 18.9 |
| Tuberculosis (all forms) | 74.4 | 77.9 | 86.1 | 80.6 | 86.6 |
| Tuberculosis of respiratory system | 64.9 | 67.9 | 75.4 | 71.2 | 75.2 |
| Cancer | 82.9 | 81.2 | 80.3 | 83.1 | 77.5 |
| Diabetes mellitus | 16.6 | 19.4 | 16.9 | 21.8 | 19.4 |
| Cerebral hemorrhage | 59.6 | 59.1 | 61.0 | 64.6 | 62.7 |
| Organic diseases of heart | 134.7 | 139.3 | 135.5 | 158.6 | 155.2 |
| Pneumonia (all forms) | 37.0 | 53.2 | 39.7 | 94.7 | 93.7 |
| Other respiratory diseases | 9.1 | 8.9 | 10.4 | 11.8 | 12.4 |
| Diarrhea and enteritis | 16.4 | 10.8 | 23.2 | 11.1 | 14.2 |
| Bright's disease (chronic nephritis) | 60.8 | 65.8 | 67.8 | 70.2 | 71.5 |
| Puerperal state | 10.2 | 11.4 | 11.5 | 11.7 | 12.9 |
| Suicides | 9.6 | 10.8 | 9.4 | 9.8 | 9.7 |
| Homicides | 7.0 | 6.2 | 7.9 | 6.7 | 6.5 |
| Other external causes (excluding suicides and homocides) | 89.7 | 65.3 | 81.1 | 60.0 | 61.4 |
| Traumatism by automobiles | 25.1 | 22.9 | 22.5 | 20.1 | 19.0 |
| All other causes | 205.5 | 199.3 | 203.5 | 202.5 | 201.5 |

*All figures in this table include insured infants under one year of age. The rates for 1931 are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

## ARKANSAS LAW RELATING TO ANTIFREEZE MIXTURES

The legislature of Arkansas, at its session in 1931, passed an act regulating the sale of antifreeze mixtures containing in excess of 10 per cent of methanol. This law (act 165, approved March 25, 1931)

contains provisions as to the coloring, labeling, etc., of antifreeze mixtures, and also requires that certain records be made and kept of the retail sale of the mixtures. The full text of the statute follows:

SECTION 1. *Antifreeze mixtures containing over 10 per cent of methanol; requirements governing sale, etc.*—On and after the passage of this act it shall be unlawful for any person to sell, offer for sale, give away, or transfer to another person any article commonly known as antifreeze containing in excess of 10 per cent of methanol, unless the following provisions are complied with:

1. It shall be distinctively colored, so that by its appearance it can not be confused with potable alcohol.

2. It shall contain an emetic or such warning substance or substances as the United States Public Health Service may recommend.

3. All containers of quantities less than tank car lots shall be plainly marked on the outside with a stencil or label securely attached, which bears the word "methanol" in red ink in letters at least one-half inch in height, and below or adjacent to such word "methanol" shall also be in red ink the skull and crossbones symbol and the words:

POISON, METHANOL IS A VIOLENT POISON, IT CAN NOT BE MADE NONPOISONOUS. IF TAKEN INTERNALLY MAY CAUSE BLINDNESS AND DEATH

SEC. 2. *Making and keeping of record of retail sales.*—It shall be unlawful for any person conducting a store, garage, filling station, or other place selling antifreeze mixtures or compounds at retail, or any of the employees of such persons, to sell, offer for sale, give away, or transfer to another person any antifreeze mixture or compound containing in excess of 10 per cent of methanol or any [m]ethyl alcohol, in quantities less than 50-gallon drum lots unless before delivery is made there be recorded in book kept for the purpose:

Date of sale.
Name and address of person to whom sold.
Article and quantity delivered.
Purpose for which it is to be used.
Name of person making sale.

Such record to be kept for inspection by the State board of health and its duly authorized representatives for a period of three years from date of last record made of sale: *Provided, however,* That no such record shall be necessary when such antifreeze mixture or compound shall be placed in an automobile radiator by the vendor at the time and place of sale, and when it is apparent that such mixture or compound is intended for antifreeze purposes: *And, provided further,* An automobile radiator shall not be construed to mean a container under the provisions of this act.

SEC. 3. *Act not applicable to certain sales of methanol.*—Nothing contained in this act shall be construed to apply to sales of methanol by or to pharmacists, or to sales by the manufacturer or dealer of methanol direct to other manufacturers for manufacturing purposes.

SEC. 4. *Definitions.*—The word "person" as used in this act shall be construed to include natural persons, partnerships, associations, and corporations.

The word "methanol" as used in this act shall be construed to mean and include the products commonly known as methanol, and methyl alcohol, wood alcohol, wood naphtha, methyl hydroxide, and methyl hydrate.

SEC. 5. *Penalty.*—Any person violating any of the provisions of this act shall be guilty of a misdemeanor and upon conviction shall be fined in any sum not less than $25 nor more than $200.

SEC. 6. *Repeal; emergency; act immediately effective.*—All laws and parts of laws in conflict herewith are hereby repealed, and whereas the manufacture of the compound, the sale of which is herein regulated, is about to begin in this State, and whereas it is immediately necessary that the public be informed of its nature, an emergency is hereby declared and this act shall be in full force and effect from and after its passage and approval.

## DEATHS DURING WEEK ENDED AUGUST 29, 1931

*Summary of information received by telegraph from industrial insurance companies for the week ended August 29, 1931; and corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)*

| | Week ended August 29, 1931 | Corresponding week, 1930 |
|---|---|---|
| Policies in force | 74, 972, 336 | 75, 702, 504 |
| Number of death claims | 12, 281 | 12, 295 |
| Death claims per 1,000 policies in force, annual rate | 8. 5 | 8. 5 |
| Death claims per 1,000 policies, first 35 weeks of year, annual rate | 10. 0 | 9. 9 |

*Deaths [1] from all causes in certain large cities of the United States during the week ended August 29, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)*

[The rates published in this summary are based upon mid-year population estimates derived from the 1930 census]

| City | Week ended Aug. 29, 1931 | | | | Corresponding week, 1930 | | Death rate [2] for the first 35 weeks | |
|---|---|---|---|---|---|---|---|---|
| | Total deaths | Death rate [2] | Deaths under 1 year | Infant mortality rate [3] | Death rate [2] | Deaths under 1 year | 1931 | 1930 |
| Total (82 cities) | 6, 629 | 9. 7 | 623 | [4] 49 | 10. 3 | 638 | 12. 3 | 12. 3 |
| Akron | 28 | 5. 7 | 1 | 10 | 6. 3 | 5 | 8. 0 | 7. 9 |
| Albany [5] | 34 | 13. 7 | 5 | 99 | 16. 7 | 5 | 14. 0 | 15. 2 |
| Atlanta | 66 | 12. 4 | 6 | 61 | 12. 5 | 7 | 15. 5 | 16. 1 |
| White | 39 | | 3 | 48 | | 4 | | |
| Colored | 27 | (6) | 3 | 86 | (6) | 3 | (6) | (6) |
| Baltimore [5] | 182 | 11. 7 | 23 | 78 | 10. 7 | 10 | 14. 8 | 14. 3 |
| White | 141 | | 14 | 61 | | 9 | | |
| Colored | 41 | (6) | 9 | 141 | (6) | 1 | (6) | (6) |
| Birmingham | 55 | 10. 6 | 5 | 50 | 8. 8 | 5 | 14. 0 | 14. 0 |
| White | 30 | | 3 | 51 | | 2 | | |
| Colored | 25 | (6) | 2 | 49 | (6) | 3 | (6) | (6) |
| Boston | 184 | 12. 2 | 22 | 63 | 11. 3 | 21 | 14. 5 | 14. 4 |
| Bridgeport | 25 | 8. 9 | 3 | 50 | 8. 9 | 3 | 11. 4 | 11. 4 |
| Buffalo | 113 | 10. 1 | 19 | 78 | 10. 9 | 9 | 13. 5 | 13. 2 |
| Cambridge | 18 | 8. 2 | 2 | 40 | 7. 3 | 2 | 12. 4 | 12. 1 |
| Camden | 44 | 19. 3 | 8 | 139 | 14. 9 | 5 | 14. 9 | 13. 9 |
| Canton | 19 | 9. 3 | 1 | 23 | 11. 9 | 3 | 10. 5 | 10. 4 |
| Chicago [5] | 540 | 8. 1 | 50 | 44 | 9. 1 | 50 | 11. 1 | 10. 6 |
| Cincinnati | 121 | 13. 8 | 10 | 60 | 12. 7 | 3 | 16. 4 | 15. 8 |
| Cleveland | 155 | 8. 9 | 14 | 41 | 10. 6 | 12 | 11. 4 | 11. 4 |
| Columbus | 62 | 10. 9 | 5 | 49 | 15. 9 | 4 | 14. 0 | 16. 2 |
| Dallas | 36 | 6. 9 | 4 | | 8. 3 | 5 | 11. 6 | 11. 9 |
| White | 27 | | 3 | | | 4 | | |
| Colored | 9 | (6) | 1 | | (6) | 1 | (6) | (6) |
| Dayton | 38 | 9. 6 | 4 | 56 | 11. 1 | 5 | 12. 1 | 10. 5 |
| Denver | 66 | 11. 8 | 4 | 39 | 18. 4 | 13 | 14. 2 | 15. 0 |
| Des Moines | 17 | 6. 1 | 0 | 0 | 11. 7 | 3 | 11. 3 | 12. 1 |
| Detroit | 188 | 5. 9 | 20 | 32 | 8. 1 | 31 | 8. 5 | 9. 6 |
| Duluth | 23 | 11. 8 | 0 | 0 | 10. 3 | 4 | 11. 2 | 11. 3 |

Footnotes at end of table.

*Deaths from all causes in certain large cities of the United States during the week ended August 29, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930*—Continued

| City | Week ended Aug. 29, 1931 | | | | Corresponding week, 1930 | | Death rate for the first 35 weeks | |
|---|---|---|---|---|---|---|---|---|
| | Total deaths | Death rate | Deaths under 1 year | Infant mortality rate | Death rate | Deaths under 1 year | 1931 | 1930 |
| El Paso | 23 | 11.4 | 3 | ---- | 15.7 | 8 | 16.3 | 18.1 |
| Erie | 40 | 17.7 | 2 | 37 | 9.9 | 2 | 11.0 | 11.5 |
| Fall River [5 7] | 18 | 8.1 | 6 | 136 | 10.4 | 1 | 11.7 | 12.4 |
| Flint | 20 | 6.4 | 5 | 64 | 7.9 | 3 | 7.3 | 9.4 |
| Fort Worth | 28 | 8.7 | 3 | ---- | 4.4 | 2 | 11.1 | 11.2 |
| White | 25 | | 3 | | | 2 | | |
| Colored | 3 | (6) | 0 | ---- | (6) | 0 | (6) | (6) |
| Grand Rapids | 15 | 4.6 | 2 | 30 | 9.2 | 4 | 9.2 | 10.6 |
| Houston | 43 | 7.2 | 3 | ---- | 10.9 | 10 | 11.3 | 12.4 |
| White | 27 | | 1 | | | 8 | | |
| Colored | 16 | (6) | 2 | ---- | (6) | 2 | (6) | (6) |
| Indianapolis | 89 | 12.5 | 4 | 33 | 13.8 | 6 | 14.2 | 15.0 |
| White | 74 | | 3 | 28 | | 5 | | |
| Colored | 15 | (6) | 1 | 67 | (6) | 1 | (6) | (6) |
| Jersey City | 53 | 8.7 | 4 | 36 | 9.5 | 4 | 11.9 | 11.6 |
| Kansas City, Kans | 14 | 5.9 | 2 | 41 | 14.1 | 2 | 13.0 | 11.5 |
| White | 11 | | 2 | 49 | | 0 | | |
| Colored | 3 | (6) | 0 | 0 | (6) | 2 | (6) | (6) |
| Kansas City, Mo | 76 | 9.7 | 6 | 46 | 10.5 | 6 | 13.6 | 13.5 |
| Knoxville | 21 | 10.0 | 5 | 107 | 14.2 | 7 | 12.7 | 14.3 |
| White | 19 | | 5 | 119 | | 6 | | |
| Colored | 2 | (6) | 0 | 0 | (6) | 1 | (6) | (6) |
| Long Beach | 27 | 9.2 | 0 | 0 | 9.4 | 1 | 10.0 | 10.1 |
| Los Angeles | 255 | 10.1 | 15 | 44 | 11.3 | 19 | 10.9 | 11.2 |
| Louisville | 89 | 15.1 | 12 | 103 | 14.9 | 5 | 14.7 | 14.1 |
| White | 74 | | 8 | 79 | | 5 | | |
| Colored | 15 | (6) | 4 | 265 | (6) | 0 | (6) | (6) |
| Lowell [7] | 28 | 14.5 | 1 | 25 | 8.3 | 0 | 12.8 | 13.9 |
| Lynn | 11 | 5.6 | 0 | 0 | 6.1 | 1 | 9.9 | 10.8 |
| Memphis | 71 | 14.3 | 9 | 95 | 16.8 | 11 | 16.7 | 17.9 |
| White | 33 | | 3 | 50 | | 5 | | |
| Colored | 38 | (6) | 6 | 174 | (6) | 6 | (6) | (6) |
| Miami | 25 | 11.6 | 0 | 0 | 5.6 | 0 | 12.2 | 11.3 |
| White | 18 | | 0 | 0 | | 0 | | |
| Colored | 7 | (6) | 0 | 0 | (6) | 0 | (6) | (6) |
| Milwaukee | 76 | 6.7 | 14 | 61 | 8.5 | 10 | 9.6 | 9.8 |
| Minneapolis | 85 | 9.4 | 9 | 58 | 10.4 | 11 | 11.6 | 10.7 |
| Nashville | 41 | 13.7 | 5 | 74 | 14.9 | 8 | 17.2 | 17.6 |
| White | 26 | | 4 | 80 | | 6 | | |
| Colored | 15 | (6) | 1 | 59 | (6) | 2 | (6) | (6) |
| New Bedford [7] | 20 | 9.3 | 2 | 53 | 7.4 | 0 | 12.5 | 11.2 |
| New Haven | 37 | 11.9 | 6 | 114 | 8.7 | 1 | 12.6 | 13.3 |
| New Orleans | 138 | 15.4 | 15 | 82 | 14.2 | 11 | 17.3 | 17.8 |
| White | 83 | | 9 | 74 | | 8 | | |
| Colored | 55 | (6) | 6 | 98 | (6) | 3 | (6) | (6) |
| New York | 1,177 | 8.7 | 115 | 48 | 9.0 | 122 | 11.6 | 11.2 |
| Bronx Borough | 162 | 6.3 | 1 | 2 | 7.0 | 17 | 8.5 | 8.1 |
| Brooklyn Borough | 423 | 8.4 | 63 | 67 | 8.1 | 47 | 10.7 | 10.2 |
| Manhattan Borough | 425 | 12.2 | 40 | 68 | 13.2 | 51 | 17.6 | 16.6 |
| Queens Borough | 118 | 5.3 | 5 | 14 | 6.0 | 3 | 7.5 | 7.3 |
| Richmond Borough | 49 | 15.6 | 6 | 108 | 10.8 | 4 | 14.1 | 14.6 |
| Newark, N. J | 81 | 9.5 | 6 | 31 | 9.3 | 4 | 12.0 | 12.4 |
| Oakland | 60 | 10.7 | 2 | 26 | 10.6 | 3 | 10.7 | 11.1 |
| Oklahoma City | 35 | 9.3 | 7 | 97 | 8.6 | 4 | 11.2 | 10.7 |
| Omaha | 58 | 14.0 | 6 | 67 | 9.7 | 1 | 14.2 | 14.0 |
| Paterson | 26 | 9.8 | 4 | 69 | 13.2 | 6 | 13.8 | 12.6 |
| Peoria | 17 | 8.2 | 1 | 26 | 10.4 | 1 | 12.9 | 12.8 |
| Philadelphia | 360 | 9.5 | 39 | 57 | 9.5 | 32 | 13.6 | 12.9 |
| Pittsburgh | 137 | 10.6 | 10 | 35 | 13.5 | 25 | 15.0 | 14.1 |
| Portland, Oreg | 64 | 10.9 | 1 | 12 | 11.4 | 4 | 11.8 | 12.5 |
| Providence | 50 | 10.2 | 6 | 55 | 10.3 | 8 | 13.1 | 13.4 |
| Richmond | 51 | 14.4 | 6 | 87 | 10.8 | 4 | 16.1 | 15.3 |
| White | 28 | | 1 | 22 | | 3 | | |
| Colored | 23 | (6) | 5 | 217 | (6) | 1 | (6) | (6) |
| Rochester | 68 | 10.7 | 3 | 27 | 10.0 | 5 | 12.2 | 11.8 |
| St. Louis | 167 | 10.5 | 4 | 13 | 11.7 | 7 | 15.8 | 14.7 |
| St. Paul | 36 | 6.8 | 5 | 52 | 8.4 | 1 | 11.1 | 10.2 |
| Salt Lake City [5] | 32 | 11.7 | 2 | 30 | 12.6 | 3 | 12.4 | 12.8 |
| San Antonio | 56 | 12.2 | 7 | ---- | 14.1 | 16 | 15.0 | 17.5 |
| San Diego | 38 | 12.7 | 4 | 81 | 15.7 | 4 | 13.9 | 14.6 |

Footnotes at end of table.

*Deaths from all causes in certain large cities of the United States during the week ended August 29, 1931, infant mortality, annual death rate, and comparison with corresponding week of 1930.*—Continued

| City | Week ended Aug. 29, 1931 | | | | Corresponding week, 1930 | | Death rate for the first 35 weeks | |
|---|---|---|---|---|---|---|---|---|
| | Total deaths | Death rate | Deaths under 1 year | Infant mortality rate | Death rate | Deaths under 1 year | 1931 | 1930 |
| San Francisco | 156 | 12.5 | 2 | 13 | 9.7 | 4 | 13.3 | 13.1 |
| Schenectady | 16 | 8.7 | 2 | 59 | 13.1 | 2 | 10.8 | 11.5 |
| Seattle | 89 | 12.5 | 6 | 57 | 9.8 | 1 | 11.6 | 11.1 |
| Somerville | 12 | 5.9 | 1 | 37 | 9.0 | 1 | 9.3 | 10.1 |
| South Bend | 12 | 5.8 | 1 | 25 | 6.0 | 1 | 8.2 | 9.0 |
| Spokane | 20 | 9.0 | 3 | 78 | 8.6 | 0 | 12.4 | 12.4 |
| Springfield, Mass | 29 | 9.9 | 1 | 15 | 11.4 | 2 | 12.1 | 12.5 |
| Syracuse | 40 | 9.8 | 2 | 24 | 8.4 | 1 | 11.9 | 11.9 |
| Tacoma | 22 | 10.6 | 0 | 0 | 13.2 | 0 | 12.1 | 12.9 |
| Toledo | 55 | 9.7 | 4 | 37 | 11.8 | 7 | 12.3 | 12.9 |
| Trenton | 28 | 11.8 | 2 | 35 | 15.2 | 3 | 16.9 | 17.1 |
| Utica | 21 | 10.7 | 1 | 26 | 12.3 | 2 | 14.4 | 15.2 |
| Washington, D. C | 145 | 15.3 | 16 | 89 | 13.9 | 11 | 16.2 | 15.5 |
| White | 84 | | 12 | 98 | | 9 | | |
| Colored | 61 | (5) | 4 | 69 | (5) | 2 | (5) | (5) |
| Waterbury | 20 | 10.3 | 2 | 60 | 5.2 | 2 | 9.8 | 10.2 |
| Wilmington, Del.[7] | 17 | 8.3 | 4 | 86 | 12.7 | 2 | 14.3 | 14.7 |
| Worcester | 34 | 9.0 | 1 | 14 | 12.5 | 7 | 12.5 | 13.2 |
| Yonkers | 21 | 7.9 | 6 | 157 | 6.9 | 1 | 8.9 | 8.2 |
| Youngstown | 22 | 6.6 | 2 | 28 | 6.7 | 3 | 10.5 | 10.3 |

[1] Deaths of nonresidents are included. Stillbirths are excluded.
[2] These rates represent annual rates per 1,000 population, as estimated for 1931 and 1930 by the arithmetical method.
[3] Deaths under 1 year of age per 1,000 live births. Cities left blank are not in the registration area for births.
[4] Data for 77 cities.
[5] Deaths for week ended Friday.
[6] For the cities for which deaths are shown by color, the percentage of colored population in 1920 was as follows: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Miami, 31; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.
[7] Population Apr. 1, 1930; decreased 1920 to 1930, no estimate made.

# 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 September 5, 1931, and September 6, 1930**

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 5, 1931, and September 6, 1930*

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 |
| New England States: | | | | | | | | |
| Maine | 1 | | | | 2 | | 1 | 0 |
| New Hamsphire | | 2 | | 2 | | | 0 | 0 |
| Vermont | | | | | | | 0 | 0 |
| Massachusetts [1] | 38 | 30 | 1 | 2 | 26 | 24 | 2 | 1 |
| Rhode Island | 1 | 4 | | | 12 | | 0 | 0 |
| Connecticut | 6 | 5 | 2 | 1 | 5 | | 0 | 3 |
| Middle Atlantic States: | | | | | | | | |
| New York | 60 | 57 | [2] 4 | [2] 3 | 80 | 73 | 6 | 11 |
| New Jersey | 17 | 41 | | 3 | 13 | 15 | 1 | 1 |
| Pennsylvania | 71 | 50 | | | 59 | 48 | 6 | 11 |
| East North Central States: | | | | | | | | |
| Ohio | 25 | 27 | 1 | 7 | 18 | 15 | 1 | 5 |
| Indiana | 11 | 16 | 8 | 3 | 4 | 1 | 2 | 1 |
| Illinois | 54 | 57 | 11 | 15 | 20 | 12 | 4 | 2 |
| Michigan | 17 | 25 | | 1 | 13 | 35 | 1 | 9 |
| Wisconsin | 12 | 6 | 13 | 25 | 17 | 14 | 1 | 2 |
| West North Central States: | | | | | | | | |
| Minnesota | 7 | 12 | | 1 | 6 | | 5 | 1 |
| Iowa | 4 | 1 | | | 1 | | 0 | 0 |
| Missouri | 20 | 23 | | 1 | 5 | 14 | 1 | 2 |
| North Dakota | 1 | 1 | | | | | 0 | 0 |
| South Dakota | 3 | 6 | | | 1 | 1 | 0 | 0 |
| Nebraska | 4 | 1 | | | 1 | 1 | 0 | 1 |
| Kansas | 10 | 14 | 1 | 1 | 4 | 7 | 3 | 1 |
| South Atlantic States: | | | | | | | | |
| Delaware | 1 | 2 | | | 1 | 1 | 0 | 0 |
| Maryland [1] [3] | 11 | 12 | 3 | 2 | 8 | | 1 | 0 |
| District of Columbia | 2 | 9 | | 1 | 1 | 9 | 0 | 0 |
| Virginia | | | | | | | | |
| West Virginia | 10 | 11 | 11 | | 10 | 3 | 0 | 0 |

[1] Typhus fever, 1931, 9 cases; 1 case in Massachusetts; 2 cases in Maryland; 4 cases in Georgia; and 2 cases in Alabama.
[2] New York City only.
[3] Week ended Friday.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 5, 1931, and September 6, 1930*—Continued

| Division and State | Diphtheria | | Influenza | | Measles | | Meningococcus meningitis | |
|---|---|---|---|---|---|---|---|---|
| | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 |
| South Atlantic States—Continued. | | | | | | | | |
| North Carolina | 81 | 95 | ---- | 3 | 10 | 2 | 2 | 1 |
| South Carolina | 23 | 40 | 134 | 216 | 10 | ---- | 0 | 0 |
| Georgia [1] | 13 | 21 | 5 | 13 | ---- | 10 | 0 | 0 |
| Florida | 3 | 6 | ---- | ---- | 3 | 1 | 0 | 1 |
| East South Central States: | | | | | | | | |
| Kentucky | 42 | ---- | ---- | ---- | ---- | ---- | 1 | 4 |
| Tennessee | 46 | 23 | 8 | 3 | 4 | 2 | 2 | 1 |
| Alabama [1] | 19 | 23 | 1 | 4 | 5 | 7 | 1 | 2 |
| Mississippi | 63 | 15 | ---- | ---- | ---- | ---- | 1 | 1 |
| West South Central States: | | | | | | | | |
| Arkansas | 16 | 7 | ---- | 1 | 2 | ---- | 0 | 0 |
| Louisiana | 31 | 21 | 8 | 3 | 1 | 2 | 2 | 0 |
| Oklahoma [4] | 32 | 13 | 19 | 4 | 2 | 1 | 0 | 1 |
| Texas | 34 | 26 | ---- | 8 | 1 | 8 | 2 | 1 |
| Mountain States: | | | | | | | | |
| Montana | ---- | ---- | ---- | ---- | 8 | 6 | 3 | 1 |
| Idaho | ---- | ---- | ---- | ---- | ---- | 1 | 0 | 0 |
| Wyoming | 1 | 1 | ---- | ---- | 2 | ---- | 0 | 0 |
| Colorado | 10 | 9 | ---- | ---- | 2 | 4 | 0 | 1 |
| New Mexico | 1 | 1 | ---- | ---- | ---- | 3 | 0 | 2 |
| Arizona | 2 | 10 | ---- | ---- | 2 | ---- | 2 | 1 |
| Utah [3] | 1 | 1 | 6 | 4 | 2 | 2 | 1 | 2 |
| Pacific States: | | | | | | | | |
| Washington | 1 | 15 | ---- | ---- | 9 | 27 | 2 | 0 |
| Oregon | 1 | 1 | 7 | 7 | 4 | 25 | 0 | 0 |
| California | 31 | 30 | 20 | 13 | 57 | 40 | 2 | 2 |

| Division and State | Poliomyelitis | | Scarlet fever | | Smallpox | | Typhoid fever | |
|---|---|---|---|---|---|---|---|---|
| | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 |
| New England States: | | | | | | | | |
| Maine | 5 | 10 | 5 | 2 | 0 | 0 | 5 | 4 |
| New Hampshire | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 |
| Vermont | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Massachusetts [1] | 184 | 13 | 99 | 40 | 0 | 0 | 8 | 8 |
| Rhode Island | 14 | 1 | 11 | 4 | 0 | 0 | 3 | 2 |
| Connecticut | 162 | 1 | 12 | 3 | 0 | 0 | 2 | 2 |
| Middle Atlantic States: | | | | | | | | |
| New York | 554 | 47 | 76 | 56 | 1 | 1 | 47 | 32 |
| New Jersey | 84 | 1 | 40 | 20 | 0 | 0 | 8 | 16 |
| Pennsylvania | 20 | 9 | 86 | 80 | 0 | 0 | 56 | 98 |
| East North Central States: | | | | | | | | |
| Ohio | 6 | 55 | 69 | 81 | 5 | 12 | 59 | 65 |
| Indiana | 4 | 7 | 24 | 11 | 4 | 32 | 16 | 16 |
| Illinois | 42 | 19 | 68 | 64 | 9 | 19 | 40 | 56 |
| Michigan | 107 | 6 | 73 | 54 | 4 | 12 | 20 | 8 |
| Wisconsin | 69 | 9 | 9 | 20 | 2 | 3 | 7 | 8 |
| West North Central States: | | | | | | | | |
| Minnesota | 50 | 11 | 9 | 22 | 0 | 1 | 0 | 4 |
| Iowa | 6 | 10 | 10 | 8 | 3 | 6 | 1 | 11 |
| Missouri | 3 | 10 | 14 | 27 | 1 | 5 | 15 | 16 |
| North Dakota | 2 | 1 | 2 | 0 | 4 | 0 | 8 | 2 |
| South Dakota | 2 | 5 | 9. | 3 | 0 | 9 | 3 | 6 |
| Nebraska | 5 | 7 | 6 | 9 | 1 | 8 | 4 | 5 |
| Kansas | 1 | 84 | 8 | 15 | 0 | 3 | 8 | 19 |

[1] Typhus fever, 1931, 9 cases; 1 case in Massachusetts; 2 cases in Maryland; 4 cases in Georgia; and 2 cases in Alabama.
[3] Week ended Friday.
[4] Figures for 1931 are exclusive of Oklahoma City and Tulsa.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 5, 1931, and September 6, 1930*—Continued

| Division and State | Poliomyelitis | | Scarlet fever | | Smallpox | | Typhoid fever | |
|---|---|---|---|---|---|---|---|---|
| | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 | Week ended Sept. 5, 1931 | Week ended Sept. 6, 1930 |
| South Atlantic States: | | | | | | | | |
| Delaware | 0 | 1 | 2 | 4 | 0 | 0 | 4 | 7 |
| Maryland [1] [3] | 5 | 2 | 14 | 17 | 0 | 0 | 47 | 48 |
| District of Columbia | 0 | 1 | 2 | 4 | 0 | 0 | 1 | 2 |
| Virginia | 1 | | | | 3 | | | |
| West Virginia | 3 | 2 | 11 | 17 | 2 | 5 | 46 | 61 |
| North Carolina | 5 | 9 | 55 | 78 | 0 | 0 | 74 | 68 |
| South Carolina | 1 | 4 | 5 | 17 | 0 | 0 | 57 | 74 |
| Georgia [1] | 0 | 0 | 6 | 23 | 0 | 0 | 43 | 40 |
| Florida | 0 | 0 | 5 | 2 | 0 | 0 | 1 | 2 |
| East South Central States: | | | | | | | | |
| Kentucky | 1 | 0 | 43 | 36 | 2 | 3 | 51 | 68 |
| Tennessee | 0 | 3 | 25 | 33 | 0 | 2 | 69 | 90 |
| Alabama [1] | 4 | 3 | 34 | 21 | 0 | 1 | 32 | 25 |
| Mississippi | 1 | 2 | 17 | 4 | 5 | 7 | 21 | 32 |
| West South Central States: | | | | | | | | |
| Arkansas | 1 | 1 | 5 | 22 | 0 | 1 | 18 | 42 |
| Louisiana | 2 | 6 | 11 | 18 | 1 | 0 | 39 | 36 |
| Oklahoma [4] | 0 | 9 | 12 | 16 | 1 | 1 | 29 | 46 |
| Texas | 1 | 2 | 19 | 17 | 0 | 6 | 58 | 15 |
| Mountain States: | | | | | | | | |
| Montana | 2 | 1 | 22 | 10 | 5 | 7 | 0 | 4 |
| Idaho | 0 | 1 | 3 | 2 | 1 | 0 | 0 | 0 |
| Wyoming | 1 | 3 | 4 | 3 | 0 | 0 | 1 | 0 |
| Colorado | 0 | 4 | 3 | 3 | 1 | 0 | 7 | 0 |
| New Mexico | 0 | 1 | 0 | 4 | 0 | 1 | 3 | 7 |
| Arizona | 1 | 0 | 2 | 7 | 0 | 1 | 5 | 5 |
| Utah [3] | 0 | 0 | 1 | 2 | 0 | 0 | 4 | 1 |
| Pacific States: | | | | | | | | |
| Washington | 4 | 6 | 11 | 20 | 15 | 11 | 4 | 2 |
| Oregon | 1 | 0 | 5 | 12 | 6 | 7 | 11 | 5 |
| California | 8 | 53 | 61 | 32 | 3 | 11 | 15 | 14 |

[1] Typhus fever, 1931, 9 cases; 1 case in Massachusetts; 2 cases in Maryland; 4 cases in Georgia; and 2 cases in Alabama.
[3] Week ended Friday.
[4] Figures for 1931 are exclusive of Oklahoma City and Tulsa.

## SUMMARY OF MONTHLY REPORTS FROM STATES

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

| State | Meningococcus meningitis | Diphtheria | Influenza | Malaria | Measles | Pellagra | Poliomyelitis | Scarlet fever | Smallpox | Typhoid fever |
|---|---|---|---|---|---|---|---|---|---|---|
| *May, 1931* | | | | | | | | | | |
| Nevada | 1 | | 1 | | 88 | | 0 | 1 | 0 | |
| *July, 1931* | | | | | | | | | | |
| South Carolina | | 41 | 255 | 1,466 | 172 | 652 | 8 | 8 | 1 | 333 |
| *August, 1931* | | | | | | | | | | |
| Arizona | 3 | 4 | 4 | 1 | 3 | 1 | 1 | 3 | 1 | 18 |
| Georgia | 1 | 61 | 29 | 239 | 55 | 59 | 13 | 76 | 0 | 315 |
| Iowa | 2 | 15 | | | 8 | | 25 | 36 | 32 | 17 |
| Missouri | 13 | 77 | 8 | 71 | 16 | 1 | 18 | 65 | 11 | 106 |
| Nebraska | 2 | 11 | | | 13 | | 1 | 27 | 10 | 21 |
| Wyoming | 4 | 1 | | | 8 | | 1 | 3 | 0 | 1 |

| *May, 1931* | Cases |
|---|---|
| Nevada: | |
| Chicken pox | 22 |
| Mumps | 4 |
| Rocky Mountain spotted or tick fever | 6 |
| *July, 1931* | |
| South Carolina: | |
| Chicken pox | 56 |
| Diarrhea | 1,666 |
| German measles | 17 |
| Hookworm disease | 85 |
| Lethargic encephalitis | 1 |
| Mumps | 53 |
| Ophthalmia meonatorum | 8 |
| Paratyphoid fever | 20 |
| Rabies in animals | 6 |
| Rocky Mountain spotted or tick fever | 2 |
| Whooping cough | 210 |
| *August, 1931* | |
| Chicken pox: | |
| Georgia | 11 |
| Iowa | 14 |
| Missouri | 9 |
| Nebraska | 11 |
| Wyoming | 1 |
| Dengue: | |
| Georgia | 4 |
| Dysentery: | |
| Arizona | 5 |
| Georgia | 26 |
| Missouri | 2 |
| German measles: | |
| Iowa | 1 |
| Lethargic encephalitis: | |
| Georgia | 1 |
| Mumps: | |
| Arizona | 1 |
| Georgia | 25 |
| Iowa | 14 |
| Missouri | 35 |
| Nebraska | 83 |
| Wyoming | 1 |
| Paratyphoid fever: | |
| Georgia | 5 |
| Rabies in animals: | |
| Missouri | 11 |
| Rocky Mountain spotted or tick fever: | |
| Arizona | 1 |
| Septic sore throat: | |
| Georgia | 36 |
| Missouri | 16 |
| Nebraska | 1 |
| Trachoma: | |
| Arizona | 4 |
| Tularaemia: | |
| Missouri | 1 |
| Typhus fever: | |
| Georgia | 21 |
| Undulant fever: | |
| Georgia | 2 |
| Iowa | 4 |
| Missouri | 20 |
| Whooping cough: | |
| Arizona | 12 |
| Georgia | 48 |
| Iowa | 62 |
| Missouri | 498 |
| Nebraska | 74 |
| Wyoming | 21 |

## RECIPROCAL NOTIFICATIONS

*Notifications regarding communicable diseases sent during the month of May, 1931, by departments of health of certain States to other State health departments*

| Disease | California | Connecticut | Illinois | Kansas | Massachusetts | Minnesota | New York | Washington |
|---|---|---|---|---|---|---|---|---|
| Gonorrhea | | | | | | 1 | | |
| Meningitis | | | | | | 1 | 1 | |
| Scarlet fever | | 2 | | | 1 | | 1 | |
| Smallpox | | | | | | 1 | | |
| Syphilis | | | | 8 | | 1 | | |
| Tuberculosis | 1 | | 23 | | | 32 | | |
| Typhoid fever | 1 | | | | | 1 | | |
| Whooping cough | | | | | | | | 1 |

## GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 95 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 32,975,000. The estimated population of the 88 cities reporting deaths is more than 31,430,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

*Weeks ended August 29, 1931, and August 30, 1930*

| | 1931 | 1930 | Estimated expectancy |
|---|---|---|---|
| *Cases reported* | | | |
| Diphtheria: | | | |
| 46 States | 695 | 631 | ---------- |
| 95 cities | 196 | 241 | 361 |
| Measles: | | | |
| 45 States | 545 | 445 | ---------- |
| 95 cities | 140 | 123 | ---------- |
| Meningococcus meningitis: | | | |
| 46 States | 65 | 87 | ---------- |
| 95 cities | 21 | 39 | ---------- |
| Poliomyelitis: | | | |
| 46 States | 1,319 | 344 | ---------- |
| Scarlet fever: | | | |
| 46 States | 935 | 650 | ---------- |
| 95 cities | 258 | 258 | 231 |
| Smallpox: | | | |
| 46 States | 137 | 122 | ---------- |
| 95 cities | 6 | 10 | 6 |
| Typhoid fever: | | | |
| 46 States | 961 | 916 | ---------- |
| 95 cities | 140 | 152 | 159 |
| *Deaths reported* | | | |
| Influenza and pneumonia: | | | |
| 88 cities | 305 | 326 | ---------- |
| Smallpox: | | | |
| 88 cities | 0 | 0 | ---------- |

## *City reports for week ended August 29, 1931*

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 of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded, and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1922 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviation 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 | 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 | 0 | 0 | 0 | | 0 | 0 | 1 | 1 |
| **New Hampshire:** | | | | | | | | |
| Concord | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Nashua | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| **Vermont:** | | | | | | | | |
| Barre | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| **Massachusetts:** | | | | | | | | |
| Boston | 6 | 13 | 14 | | 0 | 6 | 3 | 14 |
| Fall River | 1 | 0 | 1 | | 0 | 2 | 1 | 0 |
| Springfield | 0 | 1 | 0 | | 0 | 1 | 1 | 0 |
| Worcester | 1 | 2 | 0 | | 0 | 0 | 7 | 0 |
| **Rhode Island:** | | | | | | | | |
| Pawtucket | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Providence | 0 | 2 | 0 | | 0 | 15 | 0 | 2 |
| **Connecticut:** | | | | | | | | |
| Bridgeport | 0 | 2 | 2 | | 0 | 2 | 1 | 2 |
| Hartford | | 2 | | | | | | |
| New Haven | 5 | 1 | 0 | | 0 | 0 | 2 | 0 |
| **MIDDLE ATLANTIC** | | | | | | | | |
| **New York:** | | | | | | | | |
| Buffalo | 1 | 7 | 3 | | 0 | 2 | 2 | 5 |
| New York | 7 | 76 | 31 | 4 | 2 | 18 | 10 | 82 |
| Rochester | 2 | 2 | 1 | | 0 | 3 | 1 | 6 |
| Syracuse | 2 | 1 | 1 | | 0 | 3 | 0 | 1 |
| **New Jersey:** | | | | | | | | |
| Camden | 0 | 1 | 0 | | 1 | 0 | 0 | 2 |
| Newark | 4 | 6 | 0 | 1 | 0 | 1 | 3 | 9 |
| Trenton | 0 | 1 | 0 | | 0 | 0 | 0 | 0 |
| **Pennsylvania:** | | | | | | | | |
| Philadelphia | 2 | 25 | 4 | 1 | 0 | 1 | 4 | 16 |
| Pittsburgh | 1 | 9 | 1 | | 1 | 1 | 3 | 14 |
| Reading | 0 | 0 | 0 | | 0 | 1 | 0 | 0 |
| **EAST NORTH CENTRAL** | | | | | | | | |
| **Ohio:** | | | | | | | | |
| Cincinnati | 0 | 3 | 0 | | 0 | 0 | 0 | 5 |
| Cleveland | 1 | 16 | 2 | 3 | 0 | 7 | 12 | 9 |
| Columbus | 0 | 2 | 0 | 1 | 0 | 2 | 2 | 0 |
| Toledo | 0 | 3 | 2 | | 0 | 2 | 0 | 2 |
| **Indiana:** | | | | | | | | |
| Fort Wayne | 0 | 1 | 2 | | 0 | 0 | 0 | 0 |
| Indianapolis | 0 | 2 | 1 | | 0 | 1 | 7 | 6 |
| South Bend | 0 | 0 | 0 | | 0 | 0 | 0 | 1 |
| Terre Haute | | 0 | | | | | | |
| **Illinois:** | | | | | | | | |
| Chicago | 2 | 46 | 34 | 1 | 2 | 14 | 6 | 11 |
| Springfield | 0 | 0 | 4 | | 0 | 0 | 1 | 1 |
| **Michigan:** | | | | | | | | |
| Detroit | 2 | 22 | 10 | | 0 | 1 | 2 | 5 |
| Flint | 1 | 1 | 0 | | 0 | 0 | 2 | 1 |
| Grand Rapids | 0 | 1 | 0 | | 0 | 1 | 0 | 0 |

*City reports for week ended August 29, 1931*—Continued

| Division, State, and city | 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—contd.** | | | | | | | | |
| Wisconsin: | | | | | | | | |
| Kenosha | 0 | 1 | 0 | | 0 | 1 | 1 | 1 |
| Madison | 1 | 0 | 1 | | | 0 | 3 | |
| Milwaukee | 15 | 5 | 1 | | 0 | 8 | 7 | 1 |
| Racine | 0 | 0 | 0 | | 0 | 2 | 6 | 0 |
| Superior | 0 | 0 | 0 | | 0 | 0 | 2 | 1 |
| **WEST NORTH CENTRAL** | | | | | | | | |
| Minnesota: | | | | | | | | |
| Duluth | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Minneapolis | 2 | 0 | 0 | | 0 | 2 | 5 | 6 |
| St. Paul | | 4 | | | | | | |
| Iowa: | | | | | | | | |
| Des Moines | 0 | 1 | 1 | | | 0 | 0 | |
| Sioux City | 0 | 0 | 3 | | | 0 | 2 | |
| Waterloo | 0 | 0 | 0 | | | 0 | 0 | |
| Missouri: | | | | | | | | |
| Kansas City | 0 | 1 | 2 | | 0 | 1 | 4 | 6 |
| St. Joseph | 0 | 0 | 2 | | 0 | 0 | 0 | 1 |
| St. Louis | 1 | 14 | 7 | | | 1 | 1 | 1 |
| North Dakota: | | | | | | | | |
| Fargo | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Grand Forks | 0 | 0 | 0 | | | 0 | 0 | |
| South Dakota: | | | | | | | | |
| Sioux Falls | 0 | 0 | 0 | | | 0 | 0 | |
| Nebraska: | | | | | | | | |
| Omaha | 0 | 3 | 4 | | 0 | 0 | 0 | 2 |
| Kansas: | | | | | | | | |
| Topeka | 0 | 0 | 1 | | 1 | 0 | 6 | 0 |
| Wichita | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| **SOUTH ATLANTIC** | | | | | | | | |
| Delaware: | | | | | | | | |
| Wilmington | 0 | 1 | 0 | | 0 | 0 | 1 | 0 |
| Maryland: | | | | | | | | |
| Baltimore | 3 | 11 | 8 | 1 | 0 | 0 | 1 | 14 |
| Cumberland | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Frederick | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| District of Columbia: | | | | | | | | |
| Washington | 1 | 6 | 6 | 2 | 2 | 1 | 0 | 7 |
| Virginia: | | | | | | | | |
| Lynchburg | 0 | 0 | 1 | | 0 | 0 | 0 | 0 |
| Richmond | 0 | 6 | 2 | | 0 | 0 | 0 | 1 |
| Roanoke | 0 | 2 | 1 | | 0 | 1 | 0 | 1 |
| West Virginia: | | | | | | | | |
| Charleston | 2 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Wheeling | 0 | 1 | 1 | | 0 | 0 | 0 | 2 |
| North Carolina: | | | | | | | | |
| Raleigh | 0 | 1 | 0 | | 0 | 0 | 0 | 0 |
| Wilmington | 0 | 0 | 1 | | 0 | 0 | 0 | 0 |
| Winston-Salem | 0 | 1 | 7 | | 0 | 0 | 4 | 2 |
| South Carolina: | | | | | | | | |
| Charleston | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| Columbia | 0 | 0 | 4 | | 0 | 0 | 0 | 2 |
| Greenville | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Georgia: | | | | | | | | |
| Atlanta | 0 | 4 | 1 | | 0 | 0 | 0 | 4 |
| Brunswick | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| Savannah | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| Florida: | | | | | | | | |
| Miami | 0 | 1 | 0 | | 0 | 0 | 0 | 0 |
| Tampa | 0 | 1 | 0 | | 1 | 0 | 0 | 1 |

*City reports for week ended August 29, 1931*—Continued

| Division, State, and city | 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 | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 1 |
| Tennessee: | | | | | | | | |
| Memphis | 0 | 1 | 4 | ---------- | 0 | 0 | 1 | 2 |
| Nashville | 0 | 1 | 3 | ---------- | 0 | 0 | 0 | 1 |
| Alabama: | | | | | | | | |
| Birmingham | 1 | 2 | 0 | ---------- | 2 | 1 | 2 | 3 |
| Mobile | 0 | 0 | 2 | ---------- | 0 | 0 | 0 | 2 |
| Montgomery | 0 | 1 | 0 | ---------- | ---------- | 0 | 0 | ---------- |
| **WEST SOUTH CENTRAL** | | | | | | | | |
| Arkansas: | | | | | | | | |
| Fort Smith | 0 | 0 | 2 | ---------- | ---------- | 2 | 0 | ---------- |
| Little Rock | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 3 |
| Louisiana: | | | | | | | | |
| New Orleans | 8 | 6 | 0 | ---------- | 0 | 4 | 0 | 11 |
| Shreveport | 0 | 0 | 1 | ---------- | 0 | 0 | 0 | 0 |
| Oklahoma: | | | | | | | | |
| Muskogee | 0 | 0 | 1 | ---------- | 0 | 0 | 0 | 0 |
| Texas: | | | | | | | | |
| Dallas | 0 | 4 | 2 | ---------- | 0 | 0 | 0 | 0 |
| Fort Worth | 0 | 0 | 3 | ---------- | 0 | 0 | 0 | 1 |
| Galveston | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 0 |
| Houston | 0 | 3 | 2 | ---------- | 0 | 0 | 0 | 0 |
| San Antonio | 0 | 2 | 3 | ---------- | 0 | 1 | 0 | 3 |
| **MOUNTAIN** | | | | | | | | |
| Montana: | | | | | | | | |
| Billings | 0 | 0 | 0 | ---------- | 0 | 2 | 0 | 0 |
| Great Falls | 0 | 1 | 0 | ---------- | 0 | 1 | 0 | 0 |
| Helena | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 0 |
| Missoula | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 0 |
| Idaho: | | | | | | | | |
| Boise | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 1 |
| Colorado: | | | | | | | | |
| Denver | 2 | 7 | 2 | ---------- | 0 | 3 | 1 | 1 |
| Pueblo | 0 | 1 | 0 | ---------- | 0 | 0 | 0 | 4 |
| New Mexico: | | | | | | | | |
| Albuquerque | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 1 |
| Arizona: | | | | | | | | |
| Phoenix | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 0 |
| Utah: | | | | | | | | |
| Salt Lake City | 4 | 1 | 0 | ---------- | 0 | 0 | 0 | 1 |
| Nevada: | | | | | | | | |
| Reno | 0 | 0 | 0 | ---------- | 0 | 0 | 0 | 0 |
| **PACIFIC** | | | | | | | | |
| Washington: | | | | | | | | |
| Seattle | 6 | 2 | 0 | ---------- | ---------- | 1 | 6 | ---------- |
| Spokane | 1 | 1 | 0 | ---------- | ---------- | 0 | 0 | ---------- |
| Tacoma | 1 | 1 | 0 | ---------- | 0 | 0 | 0 | 0 |
| Oregon: | | | | | | | | |
| Salem | 3 | 0 | 1 | ---------- | 0 | 0 | 1 | 0 |
| California: | | | | | | | | |
| Los Angeles | 2 | 18 | 11 | 8 | 0 | 5 | 5 | 8 |
| Sacramento | 0 | 1 | 0 | ---------- | 0 | 0 | 0 | 2 |
| San Francisco | 0 | 6 | 1 | 1 | 1 | 21 | 1 | 2 |

*City reports for week ended August 29, 1931*—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 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 28 |
| New Hampshire: | | | | | | | | | | | |
| Concord | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| Nashua | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vermont: | | | | | | | | | | | |
| Barre | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| Massachusetts: | | | | | | | | | | | |
| Boston | 14 | 8 | 0 | 0 | 0 | 8 | 3 | 2 | 0 | 29 | 184 |
| Fall River | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 18 |
| Springfield | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 28 |
| Worcester | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 6 | 34 |
| Rhode Island: | | | | | | | | | | | |
| Pawtucket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 14 |
| Providence | 2 | 3 | 0 | 0 | 0 | 3 | 0 | 6 | 0 | 7 | 50 |
| Connecticut: | | | | | | | | | | | |
| Bridgeport | 2 | 3 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 3 | 25 |
| Hartford | 1 | | 0 | | | | 0 | | | | |
| New Haven | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 37 |
| **MIDDLE ATLANTIC** | | | | | | | | | | | |
| New York: | | | | | | | | | | | |
| Buffalo | 5 | 8 | 0 | 0 | 0 | 4 | 1 | 1 | 0 | 21 | 109 |
| New York | 21 | 19 | 0 | 0 | 0 | 89 | 38 | 38 | 2 | 167 | 1,177 |
| Rochester | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 64 |
| Syracuse | 1 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 10 | 40 |
| New Jersey: | | | | | | | | | | | |
| Camden | 0 | 1 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 44 |
| Newark | 3 | 3 | 0 | 0 | 0 | 8 | 1 | 1 | 0 | 111 | 88 |
| Trenton | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 28 |
| Pennsylvania: | | | | | | | | | | | |
| Philadelphia | 14 | 20 | 1 | 0 | 0 | 35 | 8 | 2 | 0 | 101 | 360 |
| Pittsburgh | 7 | 4 | 0 | 0 | 0 | 12 | 2 | 1 | 0 | 22 | 137 |
| Reading | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 4 | 22 |
| **EAST NORTH CENTRAL** | | | | | | | | | | | |
| Ohio: | | | | | | | | | | | |
| Cincinnati | 3 | 11 | 0 | 0 | 0 | 8 | 3 | 1 | 0 | 8 | 121 |
| Cleveland | 9 | 10 | 0 | 0 | 0 | 15 | 4 | 1 | 0 | 46 | 155 |
| Columbus | 2 | 4 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 10 | 62 |
| Toledo | 2 | 2 | 0 | 0 | 0 | 3 | 2 | 4 | 1 | 20 | 55 |
| Indiana: | | | | | | | | | | | |
| Fort Wayne | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 24 |
| Indianapolis | 2 | 1 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 11 | |
| South Bend | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 13 |
| Terre Haute | 0 | | 0 | | | | 0 | | | | |
| Illinois: | | | | | | | | | | | |
| Chicago | 24 | 23 | 0 | 0 | 0 | 42 | 5 | 2 | 1 | 148 | 540 |
| Springfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 19 |
| Michigan: | | | | | | | | | | | |
| Detroit | 20 | 15 | 0 | 0 | 0 | 17 | 4 | 11 | 3 | 116 | 188 |
| Flint | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 20 |
| Grand Rapids | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 8 | 15 |
| Wisconsin: | | | | | | | | | | | |
| Kenosha | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 7 |
| Madison | 1 | 0 | 0 | 0 | | | 0 | 0 | | 2 | |
| Milwaukee | 5 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 55 | 76 |
| Racine | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 15 |
| Superior | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 |
| **WEST NORTH CENTRAL** | | | | | | | | | | | |
| Minnesota: | | | | | | | | | | | |
| Duluth | 3 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 2 | 23 |
| Minneapolis | 11 | 5 | 0 | 1 | 0 | 2 | 1 | 3 | 0 | 3 | 85 |
| St. Paul | 5 | | 1 | | | | 0 | | | | |
| Iowa: | | | | | | | | | | | |
| Des Moines | 2 | 2 | 0 | 9 | | | 0 | 0 | | 0 | 17 |
| Sioux City | 0 | 0 | 0 | 0 | | | 0 | 0 | | 5 | |
| Waterloo | 0 | 0 | 0 | 0 | | | 0 | 0 | | 1 | |

*City reports for week ended August 29, 1931*—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.** | | | | | | | | | | | |
| Missouri: | | | | | | | | | | | |
| Kansas City | 2 | 1 | 0 | 0 | 0 | 3 | 3 | 1 | 0 | 10 | 76 |
| St. Joseph | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 |
| St. Louis | 9 | 5 | 0 | 0 | 0 | 12 | 7 | 2 | 1 | 45 | 167 |
| North Dakota: | | | | | | | | | | | |
| Fargo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | ---- |
| Grand Forks | 0 | 0 | 0 | 0 | ---- | ---- | 0 | 0 | ---- | 2 | ---- |
| South Dakota: | | | | | | | | | | | |
| Sioux Falls | 0 | 0 | 0 | 0 | ---- | ---- | 0 | 0 | ---- | 0 | 6 |
| Nebraska: | | | | | | | | | | | |
| Omaha | 1 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 58 |
| Kansas: | | | | | | | | | | | |
| Topeka | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 14 |
| Wichita | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| **SOUTH ATLANTIC** | | | | | | | | | | | |
| Delaware: | | | | | | | | | | | |
| Wilmington | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 17 |
| Maryland: | | | | | | | | | | | |
| Baltimore | 5 | 0 | 0 | 0 | 0 | 15 | 8 | 4 | 3 | 102 | 18 |
| Cumberland | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 11 |
| Frederick | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| Dist. of Columbia: | | | | | | | | | | | |
| Washington | 4 | 3 | 0 | 0 | 0 | 12 | 3 | 2 | 1 | 16 | 145 |
| Virginia: | | | | | | | | | | | |
| Lynchburg | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 11 |
| Richmond | 2 | 5 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 48 |
| Roanoke | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 19 |
| West Virginia: | | | | | | | | | | | |
| Charleston | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 5 | 23 |
| Wheeling | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 14 |
| North Carolina: | | | | | | | | | | | |
| Raleigh | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 1 | 16 |
| Wilmington | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 8 |
| Winston-Salem | 1 | 2 | 0 | 0 | 0 | 4 | 1 | 2 | 0 | 16 | 22 |
| South Carolina: | | | | | | | | | | | |
| Charleston | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 0 | 0 | 21 |
| Columbia | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 19 |
| Greenville | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ---- |
| Georgia: | | | | | | | | | | | |
| Atlanta | 4 | 1 | 0 | 2 | 0 | 4 | 4 | 3 | 2 | 1 | 66 |
| Brunswick | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Savannah | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 20 |
| Florida: | | | | | | | | | | | |
| Miami | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 25 |
| Tampa | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| **EAST SOUTH CENTRAL** | | | | | | | | | | | |
| Kentucky: | | | | | | | | | | | |
| Covington | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 12 |
| Tennessee: | | | | | | | | | | | |
| Memphis | 1 | 8 | 0 | 0 | 0 | 11 | 9 | 1 | 0 | 12 | 71 |
| Nashville | 0 | 2 | 0 | 0 | 0 | 2 | 6 | 5 | 0 | 3 | 41 |
| Alabama: | | | | | | | | | | | |
| Birmingham | 3 | 5 | 0 | 0 | 0 | 4 | 5 | 2 | 0 | 1 | 55 |
| Mobile | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 19 |
| Montgomery | 0 | 0 | 0 | 0 | ---- | ---- | 0 | 0 | ---- | 2 | ---- |
| **WEST SOUTH CENTRAL** | | | | | | | | | | | |
| Arkansas: | | | | | | | | | | | |
| Fort Smith | 0 | 1 | 0 | 0 | ---- | ---- | 0 | 0 | ---- | 0 | ---- |
| Little Rock | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 1 | 0 | 9 |
| Louisiana: | | | | | | | | | | | |
| New Orleans | 2 | 6 | 0 | 0 | 0 | 12 | 4 | [1] 21 | 2 | 3 | 138 |
| Shreveport | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 5 | 8 | 30 |
| Oklahoma: | | | | | | | | | | | |
| Muskogee | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | ---- |

[1] 13 cases nonresidents.

*City reports for week ended August 29, 1931*—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—contd.** | | | | | | | | | | | |
| Texas: | | | | | | | | | | | |
| Dallas | 2 | 5 | 1 | 0 | 0 | 0 | 2 | 6 | 0 | 4 | 36 |
| Fort Worth | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 28 |
| Galveston | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 16 |
| Houston | 1 | 7 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 43 |
| San Antonio | 1 | 0 | 0 | 0 | 0 | 7 | 1 | 2 | 1 | 0 | 56 |
| **MOUNTAIN** | | | | | | | | | | | |
| Montana: | | | | | | | | | | | |
| Billings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 |
| Great Falls | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 |
| Helena | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Missoula | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Idaho: | | | | | | | | | | | |
| Boise | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Colorado: | | | | | | | | | | | |
| Denver | 2 | 12 | 0 | 0 | 0 | 5 | 1 | 0 | 1 | 14 | 60 |
| Pueblo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 11 |
| New Mexico: | | | | | | | | | | | |
| Albuquerque | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 2 | 8 |
| Arizona: | | | | | | | | | | | |
| Phoenix | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | ---- |
| Utah: | | | | | | | | | | | |
| Salt Lake City | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 32 |
| Nevada: | | | | | | | | | | | |
| Reno | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| **PACIFIC** | | | | | | | | | | | |
| Washington: | | | | | | | | | | | |
| Seattle | 3 | 4 | 1 | 1 | ---- | ---- | 1 | 2 | ---- | 16 | ---- |
| Spokane | 2 | 0 | 0 | 1 | ---- | ---- | 0 | 1 | ---- | 8 | ---- |
| Tacoma | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 22 |
| Oregon: | | | | | | | | | | | |
| Salem | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ---- |
| California: | | | | | | | | | | | |
| Los Angeles | 7 | 12 | 1 | 0 | 0 | 23 | 0 | 0 | 0 | 30 | 255 |
| Sacramento | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 1 | 25 |
| San Francisco | 5 | 4 | 0 | 0 | 0 | 8 | 1 | 2 | 0 | 12 | 153 |

| 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** | | | | | | | | | |
| Maine: | | | | | | | | | |
| Portland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Massachusetts: | | | | | | | | | |
| Boston | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 43 | 9 |
| Fall River | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 1 |
| Springfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| Worcester | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 1 |
| Rhode Island: | | | | | | | | | |
| Pawtucket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Providence | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 16 | 1 |
| Connecticut: | | | | | | | | | |
| Bridgeport | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 |
| New Haven | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 |
| **MIDDLE ATLANTIC** | | | | | | | | | |
| New York: | | | | | | | | | |
| Buffalo | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| New York | 2 | 1 | 3 | 1 | 0 | 0 | 10 | 432 | 44 |
| Rochester | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 | 1 |
| New Jersey: | | | | | | | | | |
| Newark | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 |
| Trenton | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Pennsylvania: | | | | | | | | | |
| Philadelphia | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | 2 |
| Pittsburgh | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 |

*City reports for week ended August 29, 1931*—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: | | | | | | | | | |
| Cincinnati | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Cleveland | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| Toledo | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indiana: | | | | | | | | | |
| Fort Wayne | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indianapolis | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Illinois: | | | | | | | | | |
| Chicago | 3 | 2 | 0 | 0 | 0 | 0 | 3 | 6 | 2 |
| Michigan: | | | | | | | | | |
| Detroit | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 15 | 0 |
| Grand Rapids | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Wisconsin: | | | | | | | | | |
| Madison | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| Milwaukee | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 10 | 0 |
| Superior | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **WEST NORTH CENTRAL** | | | | | | | | | |
| Minnesota: | | | | | | | | | |
| Duluth | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 1 |
| Minneapolis | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 2 |
| Missouri: | | | | | | | | | |
| Kansas City | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| St. Louis | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 |
| **SOUTH ATLANTIC** | | | | | | | | | |
| Maryland: | | | | | | | | | |
| Baltimore | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| District of Columbia: | | | | | | | | | |
| Washington | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 |
| West Virginia: | | | | | | | | | |
| Wheeling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| North Carolina: | | | | | | | | | |
| Wilmington | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Winston-Salem | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| South Carolina: | | | | | | | | | |
| Charleston[1] | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Georgia: | | | | | | | | | |
| Atlanta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| Savannah[1] | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **EAST SOUTH CENTRAL** | | | | | | | | | |
| Tennessee: | | | | | | | | | |
| Memphis | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Alabama: | | | | | | | | | |
| Birmingham | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Mobile[1] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **WEST SOUTH CENTRAL** | | | | | | | | | |
| Arkansas: | | | | | | | | | |
| Little Rock | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Louisiana: | | | | | | | | | |
| New Orleans | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| Texas: | | | | | | | | | |
| Fort Worth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **MOUNTAIN** | | | | | | | | | |
| Montana: | | | | | | | | | |
| Great Falls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Missoula | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| **PACIFIC** | | | | | | | | | |
| Washington: | | | | | | | | | |
| Tacoma | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| California: | | | | | | | | | |
| Los Angeles | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 1 |
| San Francisco | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

[1] Typhus fever, 3 cases: 1 case at Charleston, S. C.; 1 case at Savannah, Ga.; and 1 case at Mobile, Ala.

The following tables give the rates per 100,000 population for 98 cities for the 5-week period ended August 29, 1931, compared with those for a like period ended August 30, 1930. The population figures used in computing the rates are estimated mid-year populations for 1930 and 1931, respectively, derived from the 1930 census. The 98 cities reporting cases have an estimated aggregate population of more than 33,000,000. The 91 cities reporting deaths have more than 31,500,000 estimated population.

*Summary of weekly reports from cities, July 26 to Aug. 29, 1931.—Annual rates per 100,000 population compared with rates for the corresponding period of 1930* [1]

DIPHTHERIA CASE RATES

| | Week ended— | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. 1, 1931 | Aug. 2, 1930 | Aug. 8, 1931 | Aug. 9, 1930 | Aug. 15, 1931 | Aug. 16, 1930 | Aug. 22, 1931 | Aug. 23, 1930 | Aug. 29, 1931 | Aug. 30, 1930 |
| 98 cities | 35 | 38 | 31 | 37 | [2] 32 | 31 | [3] 30 | 33 | [4] 31 | 38 |
| New England | 53 | 36 | 65 | 34 | 41 | 44 | 67 | 44 | [5] 44 | 53 |
| Middle Atlantic | 31 | 34 | 26 | 32 | 26 | 22 | 19 | 27 | 18 | 29 |
| East North Central | 38 | 48 | 31 | 48 | [2] 30 | 36 | [2] 28 | 40 | [2] 33 | 45 |
| West North Central | 17 | 35 | 29 | 29 | 36 | 27 | [6] 32 | 25 | [6] 40 | 27 |
| South Atlantic | 32 | 40 | 26 | 18 | 43 | 38 | 24 | 40 | 63 | 64 |
| East South Central | 12 | 6 | 41 | 18 | 17 | 30 | 35 | 12 | 52 | 12 |
| West South Central | 61 | 35 | 64 | 49 | 47 | 49 | 68 | 63 | 34 | 66 |
| Mountain | 35 | 35 | 26 | 18 | 78 | 18 | 44 | 44 | 17 | 70 |
| Pacific | 47 | 45 | 18 | 57 | 31 | 30 | 35 | 22 | 24 | 16 |

MEASLES CASE RATES

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 98 cities | 93 | 67 | 60 | 49 | [2] 39 | 32 | [3] 29 | 28 | [4] 22 | 20 |
| New England | 132 | 106 | 135 | 99 | 79 | 65 | 63 | 65 | [5] 68 | 22 |
| Middle Atlantic | 84 | 87 | 57 | 61 | 32 | 39 | 25 | 31 | 13 | 22 |
| East North Central | 153 | 33 | 87 | 27 | [2] 61 | 19 | [2] 37 | 21 | [2] 23 | 7 |
| West North Central | 27 | 43 | 15 | 52 | 11 | 31 | [6] 15 | 19 | [6] 9 | 27 |
| South Atlantic | 47 | 60 | 34 | 24 | 10 | 24 | 20 | 20 | 4 | 32 |
| East South Central | 47 | 36 | 12 | 18 | 23 | 18 | 23 | 6 | 6 | 12 |
| West South Central | 10 | 10 | 3 | 10 | 0 | 7 | 7 | 0 | 24 | 10 |
| Mountain | 209 | 159 | 70 | 115 | 61 | 44 | 70 | 26 | 52 | 35 |
| Pacific | 57 | 105 | 43 | 63 | 49 | 43 | 22 | 40 | 53 | 30 |

SCARLET FEVER CASE RATES

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 98 cities | 47 | 38 | 46 | 31 | [2] 33 | 30 | [3] 44 | 32 | [4] 41 | 41 |
| New England | 82 | 60 | 43 | 46 | 53 | 56 | 99 | 51 | [5] 49 | 56 |
| Middle Atlantic | 52 | 21 | 51 | 20 | 31 | 17 | 38 | 25 | 30 | 26 |
| East North Central | 52 | 50 | 60 | 45 | [2] 48 | 39 | [2] 57 | 35 | [2] 43 | 47 |
| West North Central | 31 | 48 | 19 | 27 | 23 | 29 | [6] 21 | 35 | [6] 34 | 43 |
| South Atlantic | 41 | 44 | 38 | 20 | 22 | 28 | 36 | 30 | 30 | 72 |
| East South Central | 35 | 6 | 41 | 12 | 41 | 48 | 17 | 30 | 70 | 102 |
| West South Central | 20 | 52 | 41 | 35 | 17 | 31 | 27 | 35 | 64 | 14 |
| Mountain | 61 | 62 | 61 | 70 | 26 | 44 | 44 | 88 | 165 | 88 |
| Pacific | 16 | 34 | 22 | 38 | 10 | 32 | 31 | 28 | 39 | 26 |

[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, 1931, and 1930, respectively.
[2] Terre Haute, Ind., not included.
[3] Terre Haute, Ind., and St. Paul, Minn., not included.
[4] Hartford, Conn., Terre Haute, Ind., and St. Paul, Minn., not included.
[5] Hartford, Conn., not included.
[6] St. Paul, Minn., not included.

*Summary of weekly reports from cities, July 26 to Aug. 29, 1931—Annual rates per 100,000 population compared with rates for the corresponding period of 1930*—Continued

SMALLPOX CASE RATES

| | Week ended— | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. 1, 1931 | Aug. 2, 1930 | Aug. 8, 1931 | Aug. 9, 1930 | Aug. 15, 1931 | Aug. 16, 1930 | Aug. 22, 1931 | Aug. 23, 1930 | Aug. 29, 1931 | Aug. 30, 1930 |
| 98 cities | 2 | 4 | 3 | 3 | [2]1 | 3 | [2]1 | 2 | [4]1 | 2 |
| New England | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | [5]0 | 0 |
| Middle Atlantic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| East North Central | 1 | 2 | 2 | 6 | [2]1 | 3 | [2]0 | 0 | [2]0 | 0 |
| West North Central | 11 | 12 | 13 | 6 | 8 | 6 | [6]6 | 8 | [6]4 | 8 |
| South Atlantic | 2 | 4 | 2 | 2 | 2 | 0 | 4 | 2 | 4 | 0 |
| East South Central | 6 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| West South Central | 3 | 14 | 0 | 7 | 0 | 3 | 0 | 7 | 0 | 3 |
| Mountain | 0 | 0 | 9 | 0 | 9 | 0 | 0 | 0 | 0 | 0 |
| Pacific | 8 | 22 | 14 | 4 | 2 | 12 | 4 | 10 | 4 | 10 |

TYPHOID FEVER CASE RATES

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 98 cities | 27 | 18 | 22 | 17 | [3]21 | 20 | [3]21 | 19 | [4]22 | 24 |
| New England | 12 | 7 | 14 | 5 | 26 | 5 | 5 | 17 | [5]23 | 12 |
| Middle Atlantic | 13 | 5 | 16 | 10 | 14 | 14 | 14 | 13 | 20 | 20 |
| East North Central | 11 | 12 | 10 | 11 | [2]7 | 10 | [2]11 | 9 | [2]10 | 10 |
| West North Central | 31 | 23 | 19 | 19 | 13 | 29 | [6]21 | 21 | [6]15 | 19 |
| South Atlantic | 77 | 52 | 53 | 66 | 77 | 44 | 55 | 60 | 38 | 88 |
| East South Central | 64 | 108 | 29 | 60 | 70 | 132 | 70 | 78 | 47 | 42 |
| West South Central | 169 | 42 | 95 | 14 | 45 | 42 | 91 | 24 | 98 | 66 |
| Mountain | 17 | 26 | 44 | 35 | 44 | 26 | 9 | 26 | 9 | 44 |
| Pacific | 4 | 16 | 14 | 10 | 12 | 12 | 8 | 6 | 12 | 8 |

INFLUENZA DEATH RATES

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 91 cities | 3 | 1 | 2 | 3 | [3]3 | 1 | [3]2 | 3 | [4]2 | 4 |
| New England | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | [5]0 | 0 |
| Middle Atlantic | 4 | 0 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| East North Central | 2 | 1 | 1 | 1 | [2]2 | 0 | [2]2 | 1 | [2]1 | 4 |
| West North Central | 0 | 0 | 0 | 3 | 3 | 3 | [6]3 | 0 | [6]3 | 3 |
| South Atlantic | 6 | 6 | 0 | 10 | 4 | 0 | 6 | 8 | 6 | 8 |
| East South Central | 13 | 0 | 13 | 0 | 6 | 0 | 0 | 0 | 13 | 6 |
| West South Central | 0 | 0 | 3 | 0 | 7 | 0 | 0 | 4 | 0 | 7 |
| Mountain | 0 | 0 | 0 | 18 | 17 | 0 | 0 | 9 | 0 | 0 |
| Pacific | 7 | 2 | 5 | 5 | 2 | 0 | 7 | 7 | 2 | 2 |

PNEUMONIA DEATH RATES

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 91 cities | 48 | 52 | 48 | 52 | [3]45 | 53 | [3]48 | 45 | [4]48 | 52 |
| New England | 41 | 41 | 34 | 46 | 29 | 41 | 36 | 56 | [5]49 | 51 |
| Middle Atlantic | 59 | 59 | 52 | 56 | 56 | 68 | 56 | 53 | 60 | 57 |
| East North Central | 30 | 43 | 35 | 47 | [2]37 | 27 | [2]32 | 27 | [2]26 | 50 |
| West North Central | 47 | 48 | 56 | 45 | 44 | 27 | [6]38 | 36 | [6]56 | 39 |
| South Atlantic | 65 | 66 | 79 | 72 | 57 | 74 | 63 | 52 | 69 | 60 |
| East South Central | 50 | 52 | 63 | 45 | 50 | 52 | 57 | 65 | 57 | 45 |
| West South Central | 59 | 75 | 62 | 53 | 52 | 85 | 59 | 57 | 59 | 36 |
| Mountain | 44 | 62 | 44 | 70 | 44 | 123 | 44 | 53 | 61 | 53 |
| Pacific | 36 | 35 | 38 | 35 | 14 | 40 | 53 | 40 | 29 | 45 |

[2] Terre Haute, Ind., not included.
[3] Terre Haute, Ind., and St. Paul, Minn., not included.
[4] Hartford, Conn., Terre Haute, Ind., and St. Paul, Minn., not included.
[5] Hartford, Conn., not included.
[6] St. Paul, Minn., not included.

# FOREIGN AND INSULAR

## CANADA

*Provinces—Communicable diseases—Week ended August 22, 1931.*—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended August 22, 1931, as follows:

| Province | Cerebro-spinal fever | Influenza | Poliomy-elitis | Smallpox | Typhoid fever |
|---|---|---|---|---|---|
| Prince Edward Island [1] | | | | | |
| Nova Scotia | | | 1 | | 1 |
| New Brunswick | | | | | 2 |
| Quebec | | | 26 | | 26 |
| Ontario | 4 | | 10 | 4 | 22 |
| Manitoba | | | 1 | | 4 |
| Saskatchewan | | 14 | | 10 | 1 |
| Alberta [1] | | | | | |
| British Columbia | | | 2 | | 3 |
| Total | 4 | 14 | 40 | 14 | 59 |

[1] No case of any disease included in the table was reported during the week.

*Quebec—Communicable diseases—Week ended August 22, 1931.*—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the week ended August 22, 1931, as follows:

| Disease | Cases | Disease | Cases |
|---|---|---|---|
| Chicken pox | 4 | Poliomyelitis | 26 |
| Diphtheria | 15 | Scarlet fever | 26 |
| Erysipelas | 1 | Tuberculosis | 46 |
| German measles | 5 | Typhoid fever | 25 |
| Measles | 16 | Whooping cough | 18 |

## CUBA

*Habana—Communicable diseases—Four weeks ended August 15, 1931.*—During the four weeks ended August 15, 1931, certain communicable diseases were reported in Habana, Cuba, as follows:

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Chicken pox | 1 | 1 | Scarlet fever | 3 | |
| Diphtheria | 7 | | Tuberculosis | 39 | 8 |
| Malaria | 7 | 1 | Typhoid fever | 26 | 10 |
| Measles | 63 | | | | |

*Provinces—Communicable diseases—Three weeks ended July 4, 1931.*—During the three weeks ended July 4, 1931, cases of certain communicable diseases were reported in the Provinces of Cuba as follows:

| Disease | Pinar del Rio | Habana | Matanzas | Santa Clara | Camaguey | Oriente | Total |
|---|---|---|---|---|---|---|---|
| Cancer | | | 1 | 1 | | | 2 |
| Chicken pox | | 10 | 2 | | | 29 | 41 |
| Diphtheria | | 12 | 1 | 1 | 1 | 1 | 16 |
| Malaria | | 2 | | | 2 | 42 | 46 |
| Measles | | 66 | 6 | 10 | 2 | | 84 |
| Paratyphoid fever | | 1 | 1 | 1 | | 2 | 5 |
| Scarlet fever | | 2 | | 1 | | | 3 |
| Typhoid fever | 2 | 33 | 8 | 27 | 6 | 14 | 90 |

## GREAT BRITAIN

*Scotland—Vital statistics—Quarter ended June 30, 1931.*—The Registrar General of Scotland has published the following statistics for the second quarter of the year 1931:

| | |
|---|---|
| Population (provisional) | 4,842,554 |
| Births | 24,122 |
| Birth rate per 1,000 population | 20.0 |
| Deaths | 15,918 |
| Death rate per 1,000 population | 13.2 |
| Marriages | 8,158 |
| Deaths under 1 year | 1,867 |
| Deaths under 1 year per 1,000 births | 77 |
| Deaths from— | |
| Bronchitis | 795 |
| Broncho-pneumonia | 592 |
| Cerebrospinal fever | 85 |
| Diabetes | 158 |
| Diphtheria | 82 |
| Dysentery | 4 |
| Erysipelas | 40 |
| Heart disease | 2,286 |
| Deaths from—Continued. | |
| Influenza | 310 |
| Lethargic encephalitis | 31 |
| Lobar pneumonia | 402 |
| Measles | 84 |
| Nephritis (acute) | 55 |
| Nephritis (chronic) | 368 |
| Pneumonia (not otherwise defined) | 229 |
| Poliomyelitis | 7 |
| Puerperal sepsis | 44 |
| Scarlet fever | 43 |
| Syphilis | 25 |
| Tetanus | 2 |
| Tuberculosis | 1,175 |
| Typhoid fever | 5 |
| Whooping cough | 308 |

## JAMAICA

*Communicable diseases—Four weeks ended August 15, 1931.*—During the four weeks ended August 15, 1931, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island of Jamaica outside of Kingston, as follows:

| Disease | Kingston | Other localities | Disease | Kingston | Other localities |
|---|---|---|---|---|---|
| Cerebrospinal meningitis | | 1 | Puerperal fever | | 2 |
| Chicken pox | 1 | 4 | Scarlet fever | | 8 |
| Dysentery | | 2 | Tuberculosis | 34 | 91 |
| Leprosy | | 2 | Typhoid fever | 17 | 99 |

## PANAMA CANAL ZONE

*Communicable diseases—July, 1931.*—During the month of July, 1931, certain communicable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities as follows:

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Chicken pox | 7 | | Measles | 40 | |
| Diphtheria | 5 | | Mumps | 1 | |
| Dysentery (amebic) | 4 | 1 | Pneumonia | | 35 |
| Dysentery (bacillary) | 1 | | Tuberculosis | | 25 |
| Leprosy | 1 | 1 | Typhoid fever | 1 | |
| Malaria | 327 | 5 | Whooping cough | 12 | |

## YUGOSLAVIA

*Communicable diseases—July, 1931.*—During the month of July, 1931, certain communicable diseases were reported in Yugoslavia, as follows:

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Anthrax | 119 | 8 | Paratyphoid fever | 11 | 1 |
| Cerebrospinal meningitis | 7 | 5 | Puerperal fever | 11 | 1 |
| Diphtheria and croup | 458 | 50 | Scarlet fever | 312 | 17 |
| Dysentery | 368 | 31 | Tetanus | 48 | 28 |
| Erysipelas | 131 | 7 | Typhoid fever | 289 | 37 |
| Lethargic encephalitis | 1 | | Typhus fever | 3 | |
| Measles | 318 | 14 | | | |

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

From medical officers of the Public Health Service, American consuls, International Office of Public Hygiene, Pan American Sanitary Bureau, 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 | | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 | | | | July, 1931 | | | | August, 1931 | | | | | Sept. 5, 1931 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 6 | 13 | 20 | 27 | 4 | 11 | 18 | 25 | 1 | 8 | 15 | 22 | 29 | |
| Ceylon: Colombo | C | 1 | | 1 | 1 | | | | | | | | 1 | 1 | 1 | | | |
| | D | | | 1 | 1 | | | | | | | | 1 | 1 | 1 | | | |
| China: | | | | | | | | | | | | | | | | | | |
| Canton | C | | 1 | 2 | | | 1 | | | | | | | | | | | |
| | D | | | 1 | | | | | | | | | | | | | | |
| Shanghai | C | | | | | | | | | 1 | | | | 1 | 5 | 1 | | |
| Swatow | C | | | | | 3 | 1 | 6 | 7 | | | | | | | | | |
| Tientsin | C | | | 1 | | 2 | 8 | | | | | | | | | | | |
| | D | | | 1 | | | 1 | | | | | | | | | | | |
| India | C | 8,968 | 11,462 | 13,604 | 3,932 | 4,657 | 4,687 | 4,725 | 4,737 | 5,002 | | | | | | | | |
| | D | 4,550 | 5,767 | 7,270 | 2,146 | 2,656 | 2,704 | 2,831 | 2,677 | 2,848 | | | | | | | | |
| Bombay | C | | 2 | | | | | | | 1 | 11 | 11 | 9 | 18 | 6 | 11 | | |
| | D | | 1 | | | | | | | | 6 | 10 | 4 | 9 | 7 | 5 | | |
| Calcutta | C | 436 | 310 | 265 | 94 | 74 | 50 | 74 | 72 | 62 | 55 | 48 | 42 | 27 | 20 | 21 | | |
| | D | 256 | 176 | 149 | 57 | 47 | 26 | 38 | 35 | 34 | 58 | 28 | 10 | 7 | 7 | 6 | | |
| Karikal | C | 12 | 19 | 12 | | | | | | | | | | | | | | |
| | D | 12 | 14 | 7 | | | | | | | | | | | | | | |
| Madras | C | 20 | 26 | 52 | 3 | 6 | | | 2 | 2 | | | 1 | | 2 | 3 | | |
| | D | 10 | 13 | 17 | | 4 | | | | | | | | | | | | |
| Moulmein | C | | | | | | | | | | 1 | | | | | | | |
| | D | | | | | | | | | | 1 | | | | | | | |
| Negapatam | D | | | | | | | | | | | | | | | | 1 | |
| Rangoon | C | | | 2 | | 2 | | 2 | | 1 | 2 | 1 | | 1 | 1 | | | |
| | D | | | 1 | | 1 | | 1 | | | 1 | | | 1 | 1 | | | |
| Vizagapatam | C | | | | | | | 1 | | | | | | | | | | |
| India (French): | | | | | | | | | | | | | | | | | | |
| Chandernagor | C | 7 | 6 | 4 | | 1 | 2 | | 1 | 1 | 1 | 2 | 1 | 4 | 2 | | | |
| | D | 6 | 5 | 4 | | 1 | 2 | | | 1 | | | 1 | 4 | 2 | | | |
| Pondicherry | C | 100 | 24 | 17 | 1 | 1 | 1 | | | 1 | 1 | 1 | 1 | | 1 | | | |
| | D | 18 | 4 | 7 | 1 | 1 | 1 | | | 1 | 1 | 1 | 1 | | 1 | | | |
| India (Portuguese) | C | | | | | | | 1 | | 2 | | | | | | | | |
| | D | | | | | | | | | 1 | | | | | | | | |
| Indo-China (see also table below): | | | | | | | | | | | | | | | | | | |
| Cochin-China—Rachgia | C | | | | | | | | | | | | P | | | | | |
| Pnompenh | C | | 2 | | 1 | | | | | 1 | 4 | | | 1 | | 1 | | |
| | D | 1 | 1 | 2 | 1 | | | | | 1 | 1 | | | 1 | | | | |
| Saigon and Cholon | C | 5 | 27 | 104 | 18 | 16 | 14 | 13 | 8 | 3 | 3 | | | | | | | |
| | D | 5 | 22 | 76 | 9 | 14 | 9 | 9 | 3 | 2 | 2 | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iraq: | | | | | | | | | | | | | | | | | | | |
| Abulkhasib | C | | | | | | | | | | | | | | | | 6 | | |
| | D | | | | | | | | | | | | | | | | 5 | | |
| Amara | C | | | | | | | | | | | | | | | 2 | 22 | 35 | |
| | D | | | | | | | | | | | | | | | 1 | 21 | 30 | |
| Amara Province | C | | | | | | | | | | | | | | | | 6 | 11 | |
| | D | | | | | | | | | | | | | | | | 5 | 4 | |
| Basra | C | | | | | | | | | | | 3 | 9 | 263 | 272 | 148 | | | |
| | D | | | | | | | | | | | 2 | 8 | 140 | 137 | 76 | | | |
| Basra Province | C | | | | | | | | | | | | | | 5 | 14 | 6 | | |
| | D | | | | | | | | | | | | | | 2 | 10 | 3 | | |
| Muntafiq Province | C | | | | | | | | | | | | | | | 10 | 21 | | |
| | D | | | | | | | | | | | | | | | 8 | 20 | | |
| Suqelshuyukh | C | | | | | | | | | | | | | | | 2 | | | |
| | D | | | | | | | | | | | | | | | 2 | | | |
| Persia: Rafsanjan [1] | C | | | 36 | | | | | | | | | | | | | | | |
| | D | | | 14 | | | | | | | | | | | | | | | |
| Philippine Islands: [2] Provinces— | | | | | | | | | | | | | | | | | | | |
| Capiz | C | 48 | 29 | 17 | 4 | | | | | | | | | | | | | | 9 |
| | D | 41 | 24 | 15 | 4 | | | | | | | | | | | | | | 5 |
| Cebu | C | | | | | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | | | | | |
| Iloilo | C | 7 | | | 8 | 7 | 5 | 6 | 24 | 3 | | | | | | | | | |
| | D | 4 | | | 6 | 5 | 6 | 4 | 22 | 3 | | | | | | | | | |
| Masbate | C | 21 | | | | | | | | | | | | | | | | | |
| | D | 9 | | | | | | | | | | | | | | | | | |
| Negros, Occidental | C | | | | | | | | | | | | | | | | | | |
| | D | | | | | | | 2 | | | | | | | | | | | |
| Pampanga | C | | | 1 | | | | 1 | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | | | | | |
| Siam | C | 10 | 16 | 14 | | 1 | 3 | | 1 | 1 | | | 1 | | | | | | |
| | D | 2 | 4 | 5 | | 1 | 1 | | | 1 | | | | | | | | | |
| Ayudhaya District | C | 1 | | | | | | | | | | | | | | | | | |
| Bangkok | C | 3 | 3 | | | | | 1 | 1 | | | 3 | | | 1 | | | | |
| | D | 2 | 2 | 1 | | | | 1 | | | | 2 | | | | | | | |
| Bismulok Province | C | 8 | | | | | | | | | | | | | | | | | |
| | D | 2 | | | | | | | | | | | | | | | | | |
| On vessel: | | | | | | | | | | | | | | | | | | | |
| S. S. Arankola, at Rangoon from Calcutta | C | | | 1 | | | | | | | | | | | | | | | |
| S. S. City of Eastborne, at Calcutta from Cocanada | C | | | | 1 | | | | | | | | | | | | | | |
| S. S. Tairea, at Penang from Calcutta | C | | | | | 1 | | | | | | | | | | | | | |
| S. S. Bandar Shalpour, at Bushire, Persia, from Basra | C | | | | | | | | | | | 1 | | | | | | | |
| | D | | | | | | | | | | | 1 | | | | | | | |
| S. S. Kohistan, at Basra from Bushire, Persia | C | | | | | | | | | | | 2 | | | | | | | |
| S. S. Cathay, at Kobe, Japan, from Shanghai | C | | | | | | | | | | | | | | | | 4 | | |
| | D | | | | | | | | | | | | | | | | 1 | | |

[1] From May 3 to 25, 1931, 152 cases of cholera with 75 deaths were reported in Rafsanjan and vicinity, Karman district, Persia.
[2] Figures for cholera in the Philippine Islands are subject to correction.

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

### CHOLERA—Continued

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

| Place | | February, 1931 | March, 1931 | April, 1931 | May, 1931 | | | June, 1931 | | | July, 1931 | | | Aug. 1–10, 1931 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1–10 | 11–20 | 21–31 | 1–10 | 11–20 | 21–30 | 1–10 | 11–20 | 21–31 | |
| Indo-China (French) (see also table above): | | | | | | | | | | | | | | |
| Cambodia [1] | C | 125 | 79 | 58 | -------- | 44 | 40 | 83 | 96 | -------- | 72 | 82 | 87 | 12 |
| Cochin-China [1] | C | 29 | 105 | 62 | 1 | 52 | 75 | 71 | 69 | -------- | 66 | 30 | 47 | 39 |

[1] Reports incomplete.

### PLAGUE

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 | | | | July, 1931 | | | | August, 1931 | | | | | Sept. 5, 1931 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6 | 13 | 20 | 27 | 4 | 11 | 18 | 25 | 1 | 8 | 15 | 22 | 29 | |
| Algeria: | | | | | | | | | | | | | | | | | | | |
| Algiers | C | 1 | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | 2 | -------- | -------- | -------- | -------- | -------- | -------- |
| | D | -------- | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Bone | C | -------- | -------- | -------- | -------- | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Constantine, vicinity of | C | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Philippeville | C | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | 1 | -------- | -------- | -------- | 1 | 1 | -------- | -------- | -------- |
| | D | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | 1 | -------- | -------- | -------- | 1 | -------- | -------- | -------- | -------- |
| Argentina: | | | | | | | | | | | | | | | | | | | |
| Cordoba Province | C | 2 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Entre Rios Province—Diamante | C | 2 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Jujuy Province—Palpala | C | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| San Juan Province | C | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | P | P | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Santa Fe | C | 2 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| Belgian Congo | C | -------- | 2 | -------- | -------- | -------- | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| | D | -------- | 2 | -------- | -------- | -------- | 1 | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| British East Africa (see also table below): | | | | | | | | | | | | | | | | | | | |
| Tanganyika | C | 22 | 8 | 18 | 46 | 4 | 7 | 5 | 1 | -------- | -------- | 6 | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| | D | 4 | 1 | 21 | 30 | 2 | 4 | 1 | 3 | -------- | -------- | 6 | -------- | -------- | -------- | -------- | -------- | -------- | -------- |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uganda | C | 15 | 19 | 35 | 138 | | 91 | 106 | 101 | 95 | 132 | 98 | 93 | | | | | | |
| | D | 15 | 19 | 32 | 126 | | 87 | 100 | 99 | 94 | 129 | 96 | 90 | | | | | | |
| Ceylon: Colombo | C | 11 | 8 | 4 | 3 | | 1 | | 1 | | | | 1 | 4 | 1 | 1 | | | |
| | D | 13 | 7 | 3 | 3 | | 1 | | 1 | | | | 1 | 4 | 1 | 1 | | | |
| Plague-infected rats | | 3 | 4 | 1 | 5 | | | | | | | | | 1 | 3 | 4 | | | |
| China: Amoy [1] | C | | | | 1 | | | | | | | | | | | | | | |
| | D | | | | 1 | | | | | | | | | | | | | | |
| Dutch East Indies: | | | | | | | | | | | | | | | | | | | |
| Batavia and West Java | C | 141 | 84 | 74 | 59 | 15 | 25 | 11 | 15 | 21 | 18 | 19 | 17 | | | | | | |
| | D | 128 | 80 | 71 | 59 | 15 | 25 | 11 | 15 | 21 | 18 | 19 | 17 | | | | | | |
| East Java and Madura | C | 1 | 4 | 1 | 1 | | | | | | | | | | | | | | |
| | D | 1 | 4 | 1 | 1 | | | | | | | | | | | | | | |
| Java and Madura | D | 376 | 277 | 243 | 176 | 41 | 58 | 48 | 45 | 59 | 55 | 52 | 66 | 38 | 53 | | | | |
| Egypt: | | | | | | | | | | | | | | | | | | | |
| Alexandria | C | 2 | 1 | | | | | 3 | 1 | 1 | 1 | 2 | 9 | 4 | 3 | 1 | 1 | | 2 |
| | D | | | | | | | 3 | 1 | 1 | | | 4 | 1 | 2 | | | | 1 |
| Plague-infected rats | | 1 | | | | | | | | | | | | | | | | | |
| Assiout | C | 41 | 13 | 32 | 18 | 4 | | 5 | 2 | | | | | | | | | | |
| | D | 11 | 6 | 17 | 7 | | | | 1 | | | | | | | | | | |
| Beni-Suef | C | | | 12 | 5 | | | | | | | | | | | | | | |
| | D | | | 3 | 3 | | | | | | | | | | | | | | |
| Beheira | C | | | | | | | | | | | | | 1 | | 1 | | | 2 |
| Cairo | C | | 1 | | | | | | | | | | | | | | | | |
| Dakahlia | C | | | | | | | | | | | | | | | | | | |
| Deirout | C | 16 | | 3 | 10 | 3 | | | | | | 1 | | | 2 | | | | |
| | D | 4 | | 1 | 4 | 1 | | | | | | | | | | | | | |
| Gharbieh | C | | | | | | 1 | | | | | | | | | | | | |
| | D | | | | | | 1 | | | | | | | | | | | | |
| Girga | C | | 86 | 44 | 7 | | | | | 1 | | | | | | | | | |
| | D | | 24 | 22 | 2 | | | | | | | | | | | | | | |
| Kena | C | | 5 | 3 | 1 | | | | | | | | | | | | | | |
| | D | | 2 | 1 | 1 | | | | | | | | | | | | | | |
| Manfalut | C | 15 | 17 | | | | | | | | | | | | | | | | |
| | D | 5 | 3 | | | | | | | | | | | | | | | | |
| Minieh | C | | 3 | 1 | 6 | 3 | | | | 10 | | 2 | | | | | | | |
| | D | | 2 | | 3 | 1 | | | | 2 | | 1 | 1 | | | | | | |
| Port Said | C | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | | | | | |
| | D | | | | 1 | | | 1 | 1 | 1 | | | | | | | | | |
| Tanta | C | | | | | | | | | | | | | | | | | | |
| Hawaii Territory: | | | | | | | | | | | | | | | | | | | |
| Hawaii—Hamakua—Plague-infected rats | | | | | 1 | | | | | | | | | | | 2 | | | 1 |
| Maui Island—Kula District | C | | | | | | | | | | | | | | | | | | |
| | D | | | | | | | | | | | | | | 1 | | | | |
| India | C | 5,457 | 9,139 | 6,142 | 752 | 39 | 24 | 9 | 16 | 30 | 29 | | | | 1 | | | | |
| | D | 3,661 | 7,037 | 5,199 | 602 | 25 | 14 | 2 | 10 | 15 | 13 | | | | | | | | |
| Bassein | C | 1 | | 1 | 1 | | | | | 1 | | | 3 | | 1 | | 1 | | |
| | D | 1 | | 1 | 1 | | | | | 1 | | | 2 | | 1 | | 1 | | |
| Bombay | C | 1 | 4 | 11 | 8 | | | | | 1 | | | | | | | | | |
| | D | 1 | 3 | 11 | 6 | | | | | | | | | | | | | | |
| Plague-infected rats | | 32 | 70 | 137 | 94 | 10 | 10 | 10 | 7 | 11 | 16 | 9 | 12 | 8 | 13 | 17 | 9 | | |

[1] On July 27, 1931, 1,250 cases of plague were reported in Chiobe and Changchow, China, since April.

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

### PLAGUE—Continued

[Cindicates cases; D, deaths; P, present]

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 6 | 13 | 20 | 27 | July, 1931 4 | 11 | 18 | 25 | August, 1931 1 | 8 | 15 | 22 | 29 | Sept. 5, 1931 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India—Continued. | | | | | | | | | | | | | | | | | | | |
| Burma | C | | | | | | | | | | | 7 | 9 | | | | | | |
| | D | | | | | | | | | | | 5 | 5 | | | | | | |
| Calcutta | C | | | 2 | | | | | | | | | | | | | | | |
| | D | | | 2 | | | | | | | | | | | | | | | |
| Madras Presidency | C | 74 | 23 | 3 | 2 | | 1 | 5 | | 1 | 2 | 8 | | | | | | | |
| | D | 46 | 21 | 2 | 1 | | 1 | | | | 1 | 1 | | | | | | | |
| Moulmein | C | | | | | | | | | | | 1 | | | | | | P | |
| | D | | | | | | | | | | | 1 | | | | | | | |
| Rangoon | C | | 1 | 1 | 2 | | 1 | | | | | 2 | | 1 | | | | | |
| | D | | 1 | 1 | 2 | | 1 | | | | | 1 | | 1 | | | | | |
| Plague-infected rats | | 8 | 7 | 4 | 7 | | 3 | | | 1 | 2 | 2 | 1 | 1 | | 1 | 1 | | |
| Indo-China (see also table below): Pnompenh | C | 1 | | | | 1 | | 1 | | | | | | | | | | | |
| | D | 4 | 6 | 4 | | 1 | | 1 | | | | | | | | | | | |
| Iraq: | | | | | | | | | | | | | | | | | | | |
| Baghdad | C | 3 | 8 | 23 | 23 | 10 | 6 | 1 | 6 | 1 | 1 | 1 | | | | 1 | | | 1 |
| | D | 2 | 5 | 8 | 9 | 1 | 4 | 1 | 3 | 1 | | 1 | | | | | | | |
| Maudhan | C | | | | 2 | | | | | | | | | | | | | | |
| Madagascar (see also table below): Tamatave | C | | | | | | | | | | | | | 1 | | | | | |
| Nigeria: Lagos | C | | | 5 | | | | | | | | | | | | | | | |
| | D | | | 5 | | | | | | | | | | | | | | | |
| Plague-infected rats | | | | 6 | | | | | | | | | | | | | | | |
| Peru (see table below). | | | | | | | | | | | | | | | | | | | |
| Senegal (see table below). | | | | | | | | | | | | | | | | | | | |
| Siam | C | 18 | 31 | 1 | 2 | 1 | | | | | | | | | | | | | |
| | D | 14 | 7 | 1 | 2 | 1 | | | | | | | | | | | | | |
| Bangkok | C | 6 | 29 | | | | | | | | | | | | | | | | |
| | D | 5 | 6 | | | | | | | | | | | | | | | | |
| Nagara Rajsima | C | 7 | 1 | | | | | | | | | | | | | | | | |
| | D | 6 | | | | | | | | | | | | | | | | | |
| Spain: Hospitalet—Barcelona Province | C | | | | | | | | | | | | | | | | 5 | 1 | |
| | D | | | | | | | | | | | | | | | | 2 | | |
| Syria: Beirut | C | 1 | | | | | | | | | 1 | | 1 | | | | | | |
| Tripolitania | C | 1 | | | | | | | | | | | | | | | | | |
| Tunisia: Tunis | C | 14 | 10 | 16 | 16 | | 8 | 2 | 1 | | | | | | | | | | |
| | D | 7 | 4 | 8 | 3 | | 1 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Union of South Africa: | | | | | | | | | | | | | | | | | | | | | |
| Cape Province | C | | | 3 | | | | | | | | | | | | | | | | | |
| Orange Free State | C | 1 | 6 | 2 | 2 | | | | | | | | | | | | | | | | |
| | D | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | |

| Place | | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 | July, 1931 |
|---|---|---|---|---|---|---|---|
| British East Africa (see also table above): | | | | | | | |
| Kenya | C | 21 | 7 | 345 | 245 | 154 | 471 |
| Indo-China (see also table above) | C | | 4 | 11 | | 2 | 1 |
| | D | 2 | | 2 | | 2 | 1 |
| Madagascar (see also table above): | | | | | | | |
| Ambositra Province | C | 90 | 70 | 30 | 19 | 15 | |
| | D | 88 | 86 | 29 | 18 | 15 | |
| Antisirabe Province | C | 84 | 83 | 48 | 7 | 8 | |
| | D | 79 | 74 | 47 | 7 | 8 | |
| Miarinarivo Province | C | 31 | 19 | 6 | 2 | | |
| | D | 29 | 19 | 6 | 2 | | |
| Moramanga Province | C | 7 | 1 | | 2 | | |
| | D | 7 | 1 | | 2 | | |
| Tananarive Province | C | 145 | 90 | 41 | 18 | 2 | |
| | D | 139 | 81 | 40 | 18 | 1 | |

| Place | | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 | July, 1931 |
|---|---|---|---|---|---|---|---|
| Peru | C | 12 | 8 | 8 | 2 | 5 | 2 |
| | D | 6 | 2 | 1 | | 1 | |
| Senegal: | | | | | | | |
| Baol [1] | C | | | | 4 | | 27 |
| | D | | | | 3 | | 13 |
| Dakar [1] | C | | | 2 | 63 | 64 | 95 |
| | D | | | 1 | 49 | 56 | 73 |
| Louga [1] | C | | 14 | 1 | 5 | 4 | 3 |
| | D | | 6 | | 2 | 2 | 1 |
| Rufisque [1] | C | 2 | | | 1 | 2 | 34 |
| Thies [1] | C | | | | | 12 | 16 |
| | D | | | | | | 7 |
| Tivaouane [1] | C | | | 4 | 19 | 3 | 3 |
| | D | | | | 11 | 2 | 2 |

[1] Reports incomplete.

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

### SMALLPOX

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

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 6 | 13 | 20 | 27 | July, 1931 4 | 11 | 18 | 25 | August, 1931 1 | 8 | 15 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria: | | | | | | | | | | | | | | | | | |
| Algiers | C | 1 | 2 | 2 | 1 | | 7 | 1 | | | | 1 | | | | | |
| Constantine | C | | 1 | | 1 | | | | | 1 | | | | | | | |
| Arabia: Aden | C | 1 | | | | | | | | | | | | | | | |
| Belgian Congo | C | | | | 47 | 27 | 15 | | | | | | | | | | |
| Belgium | C | 1 | | | | | | | | | | | | | | | |
| Bolivia.[1] | | | | | | | | | | | | | | | | | |
| Brazil: Porto Alegre (alastrim) | C | 7 | 49 | 53 | 19 | 2 | 3 | | | 9 | 10 | 9 | 13 | | | | |
| | D | 1 | 1 | | | 1 | | | | | 1 | | | | | | |
| British East Africa: Tanganyika | C | 91 | 8 | | 13 | | | 1 | 6 | 37 | 83 | | 29 | | | | |
| | D | 13 | 3 | | | | | | | 7 | 5 | | 5 | | | | |
| British South Africa: | | | | | | | | | | | | | | | | | |
| Northern Rhodesia | C | | | | | | | | | | 21 | | | | | | |
| Southern Rhodesia | C | | | | | | 1 | | | | 2 | | | | | | |
| Canada: | | | | | | | | | | | | | | | | | |
| Alberta | C | 1 | | | | | | | | | 1 | | | | 1 | | |
| British Columbia | C | 8 | | | | | | | | | | 2 | 2 | | | 3 | |
| Manitoba | C | 1 | | | 4 | | | | | | | | | | | | |
| Winnipeg | C | 1 | | | | | | | | | | | | | | | |
| Nova Scotia | C | | 1 | | | | | | | | | | | | | | |
| Ontario | C | 29 | 9 | 17 | 25 | | 4 | 3 | 14 | 3 | 6 | 12 | 1 | | 2 | 2 | 4 |
| Kingston | C | 1 | | 5 | | | | | | | | | | | | | |
| North Bay | C | 1 | | | | | | | | | | | | | | | |
| Ottawa | C | 1 | | | | | | 1 | | | | | | | | | |
| Sault Ste. Marie | C | 2 | | 4 | 1 | | | | | | | | | | | | |
| Toronto | C | | 2 | 4 | 1 | | | 1 | | | | | | | | | |
| Quebec | C | | | | | | | | | 1 | | | | | | | |
| Saskatchewan | C | 63 | 58 | 46 | 48 | 7 | 16 | 18 | 13 | | 13 | 10 | 19 | | 10 | 6 | 10 |
| Regina | C | 1 | 2 | 2 | 2 | | | | | | | | | | | | |
| Canary Islands: Las Palmas | C | | 1 | | | | | | | | | | | | | | |
| Chile: | | | | | | | | | | | | | | | | | |
| Antofagasta | C | | | | | | | | | 1 | | | | | | | |
| Chanaral | C | | | | 1 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| China: | | | | | | | | | | | | | | | | | |
| Amoy | C | | 1 | 2 | 6 | 1 | 2 | | 1 | 1 | 1 | | | 1 | | | |
| | D | | 1 | 1 | 3 | 1 | 1 | | 1 | 1 | 1 | | | 1 | | | |
| Canton | C | 3 | 7 | 4 | 3 | | | 1 | | 1 | | | 1 | | | | |
| Foochow | C | P | P | P | P | | P | | | | | | P | | | | |
| Hankow | C | 8 | 3 | 3 | 5 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Hong Kong | C | 9 | 2 | 3 | 1 | | | | | | | | | | | | |
| | D | 3 | 2 | 1 | 2 | | | | | | | | | | | | |
| Manchuria— | | | | | | | | | | | | | | | | | |
| Harbin (see also table below) | C | 4 | 2 | | 3 | | | | | | | | | | | | |
| Kwantung—Dairen | C | | 2 | 2 | 2 | 1 | | | | | | | | | | | |
| Nanking | C | P | P | P | P | | | | | | | | | | | | |
| Shanghai— | | | | | | | | | | | | | | | | | |
| Foreigners only | C | 16 | 6 | 17 | 7 | 2 | 6 | 2 | 1 | 2 | 1 | | | | | | |
| Including natives | D | 14 | 10 | 18 | 7 | 1 | 5 | 4 | 3 | 2 | 1 | 2 | 1 | | | | 1 |
| Swatow | D | 13 | 26 | 2 | | | | | | | | | | | | | |
| Tientsin | C | | | | 2 | | | | | | 2 | 1 | | | | | |
| Chosen (see table below). | | | | | | | | | | | | | | | | | |
| Colombia: Cali | D | | | | 1 | | | | | | | | | | | | |
| Dutch East Indies: | | | | | | | | | | | | | | | | | |
| Batavia and West Java | C | 2 | 1 | | 2 | | | | | | | | | | | | |
| | D | 1 | | | | | | | | | | | | | | | |
| East Java and Madura | C | | | | 1 | | | | | | | | | | | | |
| Finland | C | | | 1 | | | | | | | | | | | | | |
| France (see table below). | | | | | | | | | | | | | | | | | |
| Great Britain: | | | | | | | | | | | | | | | | | |
| England and Wales | C | 745 | 795 | 744 | 570 | 83 | 94 | 62 | 48 | 56 | 45 | 50 | 36 | 26 | 25 | 19 | 21 |
| Bradford | C | 1 | 2 | 6 | 8 | | | 5 | | | | | | | | | |
| Leeds | C | | 1 | 2 | 2 | | | | | | | | | | | | |
| London | C | 98 | 147 | 227 | 183 | 25 | 50 | 31 | 16 | 21 | 9 | 12 | 12 | 6 | 12 | 4 | 4 |
| London and Great Towns | C | 683 | 544 | 558 | 403 | 57 | 84 | 49 | 38 | 53 | 33 | 34 | 32 | 22 | 20 | 17 | 10 |
| | D | 1 | | 2 | | 1 | | | | 1 | | | | | | | |
| Sheffield | C | 32 | 10 | 7 | | | | | | | | | | | | | |
| Stoke-on-Trent | C | 1 | | | | | | | | | | | | | | | |
| Greece (see table below). | | | | | | | | | | | | | | | | | |
| Honduras: | | | | | | | | | | | | | | | | | |
| Amapala | C | 1 | | | | | | | | | | | | | | | |
| Ocotopeque and Gracias districts | C | P | | | | | | | | | | | | | | | |
| Puerto Castilla | C | 3 | | | | | | | | | | | | | | | |
| Tegucigalpa | C | | | 1 | | | | | | | | | | | | | |
| Tela | C | | | 1 | | | | | | | | | | | | | |
| India | C | 12,222 | 11,791 | 14,265 | 11,403 | 2,170 | 1,856 | 1,622 | 1,665 | 1,492 | 1,376 | | | | | | |
| | D | 2,660 | 2,261 | 2,923 | 1,849 | 465 | 474 | 376 | 389 | 404 | 363 | | | | | | |
| Bassein | C | | | | 1 | | | | | | | | | | | | |
| Bombay | C | 6 | 10 | 8 | 9 | | 2 | 1 | 3 | | 1 | 3 | 2 | 1 | | 1 | |
| | D | 3 | 4 | 5 | 4 | | 1 | 1 | 3 | | 1 | 3 | 2 | 1 | | | |
| Calcutta | C | 251 | 382 | 287 | 89 | 14 | 19 | 14 | | 11 | 6 | 2 | 2 | 4 | 4 | | 5 |
| | D | 188 | 203 | 224 | 75 | 12 | 18 | 11 | | 9 | 4 | 3 | 2 | | 4 | | 5 |
| Cochin | C | 59 | 46 | 39 | 8 | | | | | | | | | | 1 | 1 | |
| | D | 3 | | | | | | | | | | | | | | | |
| Karachi | C | 4 | 4 | 6 | | | | 2 | | | | | | 1 | | | |
| | D | | 2 | | | | | 1 | | | | | | | | | |

[1]An epidemic of smallpox was reported on May 18 with 716 cases and 314 deaths since the middle of April, 1931, in Mendez Province, Bolivia.

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

## SMALLPOX—Continued

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

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 6 | 13 | 20 | 27 | July, 1931 4 | 11 | 18 | 25 | August, 1931 1 | 8 | 15 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India—Continued. | | | | | | | | | | | | | | | | | |
| Madras | C | 8 | 22 | 19 | 8 | | | 1 | 1 | | 2 | | | 1 | | | |
| | D | 1 | 3 | 5 | 6 | | | | 1 | | | | | | | | |
| Negapatam | C | | | 3 | | | | 2 | 1 | | | | | | 2 | | |
| Rangoon | C | 4 | 3 | 11 | 13 | | 1 | 4 | 1 | 2 | | 1 | | 2 | | 1 | 1 |
| | D | | 1 | 1 | 5 | | 1 | | 1 | 1 | | | | 1 | | | 1 |
| Vizagapatam | C | 8 | 2 | 10 | 6 | 2 | 1 | | 3 | 2 | | 2 | 1 | | 3 | | 2 |
| | D | 2 | 1 | 2 | 1 | | 1 | | 1 | 1 | | | | | 3 | | 1 |
| India (French): | | | | | | | | | | | | | | | | | |
| Chandernagor | C | 12 | 14 | 10 | 7 | | | 1 | | 2 | | 1 | | | | | |
| | D | 1 | 2 | 7 | 5 | | | | | 2 | | | | | | | |
| Karikal | C | 19 | 3 | 4 | 4 | 1 | 2 | | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | |
| | D | 18 | | 3 | 4 | 1 | 2 | | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | |
| Pondicherry Province | C | 19 | 14 | 6 | 11 | 3 | 2 | 1 | 1 | 4 | 1 | | 23 | 11 | | | 3 |
| | D | 19 | 14 | 9 | 11 | 3 | 2 | 1 | 1 | 4 | 1 | | 23 | 11 | | | 3 |
| India (Portuguese) | C | 14 | 8 | 21 | 3 | | | | | | | | | | | | |
| | D | 3 | 3 | 6 | 1 | | | | | | | | | | | | |
| Indo-China (see also table below): | | | | | | | | | | | | | | | | | |
| Pnompenh | C | | 1 | | 1 | 2 | | | | | | | | | | | |
| | D | | | | 1 | | | | | | | | | | | | |
| Saigon and Cholon | C | 4 | 8 | 1 | 2 | | | | | 1 | | | 2 | 1 | 1 | | |
| | D | 1 | 8 | 1 | 1 | | | | | 1 | | | | 1 | | | |
| Iraq: | | | | | | | | | | | | | | | | | |
| Baghdad | C | 9 | | 2 | 3 | | 1 | | | | | | | | | | |
| | D | | | | 2 | | | | | | | | | | | | |
| Basra | C | | | | 2 | | 1 | | | | | | | | | | |
| Mosul Liwa | C | 5 | | | | | | | | | | 1 | | | | | 1 |
| | D | 1 | | | | | | | | | | | | | | | |
| Japan: | | | | | | | | | | | | | | | | | |
| Kobe | C | 2 | | | | | | | | | | | | | | | |
| Nagoya | C | | | | | | | | | | | 1 | | | | | |
| Mexico (see also table below): | | | | | | | | | | | | | | | | | |
| Jalisco (State)—Guadalajara | D | | 1 | 1 | 2 | | 1 | | | 1 | 1 | | 1 | | | 2 | |
| Mexico City and surrounding territory | C | 23 | 33 | 43 | 45 | 5 | 4 | 16 | | 12 | 5 | 4 | 1 | 8 | 2 | | |
| | D | 8 | 22 | 14 | 11 | 4 | 3 | 6 | | 4 | 3 | 1 | | 1 | 1 | | |
| Monterrey | C | | | | | 1 | | | | | | | | | | | |
| Torreon | C | | | 1 | 1 | | | 1 | 2 | | | | | | | | |
| | D | | | 2 | | | | 1 | 1 | | | | | | | | |
| Vera Cruz | C | 3 | 2 | 2 | 1 | | | | | | | | | | | | |
| Morocco (see table below). | | | | | | | | | | | | | | | | | |
| Nigeria: Lagos | C | | 2 | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poland | C | 1 | | | 3 | 1 | 1 | | 1 | | 17 | | 1 | | | | |
| Portugal: Lisbon | C | 40 | 52 | 56 | 67 | 5 | 17 | 12 | 14 | 15 | 12 | 18 | | 17 | 12 | 8 | |
| Rumania (see table below). | | | | | | | | | | | | | | | | | |
| Siam | C | 2 | | 1 | 6 | | | 4 | 1 | | 1 | | | | | | |
| | D | | | | 1 | | | | 1 | | | 1 | | | | | |
| Spain | C | P | P | | | | | | | | | | | | | | |
| Straits Settlements | C | 2 | 4 | 10 | 2 | | | | | | | 7 | | | | | |
| | D | 1 | 1 | 5 | 2 | | | | | | | | | | 1 | | |
| Sudan (Anglo-Egyptian) | C | 97 | 8 | 3 | 6 | | 1 | | | | | | | | | | |
| | D | 10 | 2 | | 2 | | | | | | | | | | | | |
| Sudan (French) (see table below). | | | | | | | | | | | | | | | | | |
| Syria (see table below). | | | | | | | | | | | | | | | | | |
| Tunisia: Tunis | C | | 4 | | | | | | | | | | | | | | |
| Turkey (see table below). | | | | | | | | | | | | | | | | | |
| Union of Socialist Soviet Republics (see table below). | | | | | | | | | | | | | | | | | |
| Union of South Africa: | | | | | | | | | | | | | | | | | |
| Cape Province | C | P | P | P | P | | | | | | | | | | | | |
| Orange Free State | C | P | P | P | P | P | P | P | P | P | P | P | | | | | |
| Transvaal | C | P | P | | | | | P | | P | | P | | | | | |
| Upper Volta | C | 18 | 3 | 3 | 88 | 11 | | 1 | | 1 | | 1 | | | | | |
| | D | | 1 | | 1 | | | | | | | | | | | | |
| On vessel: | | | | | | | | | | | | | | | | | |
| S. S. Clan Mactoggart at Suez | C | 2 | | | | | | | | | | | | | | | |
| S. S. Clan Buchanan at Suez | C | 2 | | | | | | | | | | | | | | | |
| S. S. Rotterdam at Naples from Venice | C | | 1 | | | | | | | | | | | | | | |
| S. S. Clan McTavish at Manila from Chittagong | C | | | 1 | | | | | | | | | | | | | |
| S. S. Clan MacBrayne at Cochin | C | 1 | | | | | | | | | | | | | | | |
| S. S. Chilka at Rangoon | C | 1 | | | | | | | | | | | | | | | |
| S. S. Taif (pilgrim ship) at Suakin from Jeddah | C | | | 1 | | | | | | | | | | | | | |
| S. S. Talodi at Suakin | C | | | | 1 | | | | | | | | | | | | 1 |

| Place | | Jan., 1931 | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 |
|---|---|---|---|---|---|---|---|
| China: Harbin (see also table above) | C | | | 7 | | 13 | 10 |
| Chosen | C | 1 | | 11 | | 1 | 4 |
| | D | 1 | | 3 | | | |
| France | C | 4 | 16 | 15 | 6 | 54 | |
| Greece | C | | 4 | | | 3 | 1 |
| Mexico (see also table above) | D | | 3 | | 1 | 1 | 2 |
| Morocco | C | | 4 | 6 | 7 | 49 | 48 |
| Rumania | C | | | 1 | | 1 | |

| Place | | Jan., 1931 | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 |
|---|---|---|---|---|---|---|---|
| Turkey | C | 63 | 37 | 1 | | 9 | 1 |
| | D | 7 | 6 | | | | |
| Union of Socialist Soviet Republics: | | | | | | | |
| Territories in Asia | C | 194 | 532 | | | | |
| Ukraine | C | 44 | 23 | | | | |
| Other territories in Europe | C | 896 | 1,577 | | | | |
| Railroads, etc | C | 43 | 77 | | | | |

| Place | | January, 1931 | February, 1931 | March, 1931 | April, 1931 | | | May, 1931 | | | June, 1931 | | | July, 1931 | | | Aug. 1-10, 1931 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1-10 | 11-20 | 21-30 | 1-10 | 11-20 | 21-31 | 1-10 | 11-20 | 21-30 | 1-10 | 11-20 | 21-31 | |
| Indo-China (see also table above) | C | 141 | 168 | 264 | 100 | 42 | | | 17 | 41 | 30 | 16 | 1 | 1 | | 7 | 29 |
| Sudan (French) | C | | | 4 | | | | | | | | | | | | | |
| Syria: Beirut | C | 1 | | | | | | | | | | 1 | | | | | |

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

### TYPHUS FEVER

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

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 6 | 13 | 20 | 27 | July, 1931 4 | 11 | 18 | 25 | August, 1931 1 | 8 | 15 | 22 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria: | | | | | | | | | | | | | | | | | | |
| Algiers | C | 2 | 3 | 3 | 7 | 4 | 4 | | 1 | | | 2 | | | | 1 | 1 | |
| Bone | C | | | | | | | | | | | | | | | | | |
| Constantine Department | C | 4 | 3 | 9 | 22 | 6 | 3 | 1 | 16 | 2 | | 1 | | 3 | | | | |
| Oran | C | 1 | | 1 | 2 | 2 | | | | | | | | | 1 | | | |
| Australia, Western | C | | 1 | 1 | 1 | | | | | | | | | | | | | |
| Bulgaria | C | 5 | 9 | 30 | 16 | 11 | 10 | 6 | 3 | | | | | | | | | |
| | D | | 2 | 3 | 4 | 2 | 1 | 1 | 2 | | | | | | | | | |
| Chile: Valparaiso | D | 1 | | | | | | | | | | | | | | | | |
| China: | | | | | | | | | | | | | | | | | | |
| Canton | C | | 1 | | | | | | | | | | | | | | | |
| Manchuria—Harbin | C | 5 | 3 | 8 | | | | | 16 | | | | | | | | | |
| Shanghai | C | | | | | | | | | | | 1 | | | | | | |
| Tientsin | C | | | 2 | | | | | | | | | | | | | | |
| Chosen (see table below). | | | | | | | | | | | | | | | | | | |
| Czechoslovakia (see table below). | | | | | | | | | | | | | | | | | | |
| Egypt: | | | | | | | | | | | | | | | | | | |
| Alexandria | C | | | 1 | | 1 | 1 | | 1 | | | | | | | | | |
| Beheira Province | C | | | 4 | | | | | | | | | | | | | | |
| | D | | | 2 | | | | | | | | | | | | | | |
| Eritrea: Asmara | C | | 1 | | | | | | | | | | | | | | | |
| Great Britain: Scotland— | | | | | | | | | | | | | | | | | | |
| Fife County | C | | | | 1 | | | | | | | | | | | | | |
| Greece (see table below). | | | | | | | | | | | | | | | | | | |
| Guatemala [1] (see table below). | | | | | | | | | | | | | | | | | | |
| Iraq: Baghdad | C | 5 | 2 | | 2 | | | | | | | | | | | | | |
| | D | 1 | | | 2 | | | | | | | | | | | | | |
| Irish Free State: | | | | | | | | | | | | | | | | | | |
| Cork County— | | | | | | | | | | | | | | | | | | |
| Schull | C | | | | | | | | | | 1 | | | | | | | |
| Skibbereen | C | | | | | | 1 | | 1 | 1 | | | | | | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kerry County— | | | | | | | | | | | | | | | | | | |
| Dingle | C | | | | 1 | | | | | | | | | | | | | |
| Listowel | C | | | | | | | | 1 | | | | | | | | | |
| Limerick County— | | | | | | | | | | | | | | | | | | |
| Limerick | C | | | | | | | | | 2 | | | | 1 | | | | |
| Michelstown | C | | | | | | | | | 1 | | | | | | | | |
| Mayo County— | | | | | | | | | | | | | | | | | | |
| Belmullet | C | | | | 1 | | | | | | | | | | | | | |
| Westport | C | | | | | | | | | | | | | | | | 1 | |
| Japan | C | | | | | | | | 1 | | | | | | | | | |
| Latvia (see table below). | | | | | | | | | | | | | | | | | | |
| Lithuania (see table below). | | | | | | | | | | | | | | | | | | |
| Mexico (see also table below): | | | | | | | | | | | | | | | | | | |
| Durango | D | | | | | | | | | | | | 1 | | | | | |
| Mexico City, including municipalities in Federal District | C | 35 | 216 | 170 | 75 | 7 | 12 | 27 | | 28 | 9 | 7 | 9 | 7 | 6 | | | |
| | D | 16 | 84 | 56 | 33 | 4 | 4 | 11 | | 4 | 3 | 2 | 3 | 5 | 3 | | | |
| San Luis Potosi | D | 5 | 5 | 3 | 2 | | | | | | 1 | 3 | | | | | 1 | |
| Torreon | C | | | | | | | | | | | | 1 | | | | | |
| | D | | | | | | | | | | | | 1 | | | | | |
| Morocco | C | 28 | 7 | 13 | 42 | | 31 | 42 | 28 | 37 | 20 | 24 | 21 | | 2 | 1 | | |
| | D | 1 | | 1 | 4 | | 2 | 3 | 1 | 4 | 4 | | | | | | | |
| Palestine | C | 3 | 5 | 5 | 4 | | 2 | 3 | | 2 | | | | 3 | 3 | 1 | 4 | |
| Panama Canal Zone—Balboa | C | | | | 2 | | | | | | | | | | | | | |
| Paraguay: Asuncion | D | 1 | 1 | | | | | | | | | | | | | | | |
| Poland | C | 189 | 287 | 538 | 298 | | 48 | 33 | 16 | 9 | 17 | 13 | 14 | 10 | 4 | 10 | 7 | |
| | D | 19 | 15 | 28 | 18 | | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | | 1 | | |
| Rumania | C | 152 | 214 | 70 | 169 | 42 | 16 | 12 | 10 | 2 | 2 | 7 | | | | | | |
| | D | 24 | 16 | 8 | 18 | 4 | 7 | 2 | | 2 | 2 | 1 | | | | | | |
| Syria | C | | | | 4 | | | | | | | | | | | | | |
| Tunisia: | | | | | | | | | | | | | | | | | | |
| Sbeitla, vicinity of | C | | 20 | 12 | | | | | | | | | | | | | | |
| | D | | 7 | | | | | | | | | | | | | | | |
| Sfax | C | | 2 | | | | | | | | | | | | | | | |
| Tunis | C | 18 | 14 | 13 | 29 | | 64 | 9 | | 1 | | | 1 | | | | | |
| | D | | | | 3 | | 4 | | | | | | | | | | | |
| Turkey (see table below). | | | | | | | | | | | | | | | | | | |
| Union of Socialist Soviet Republics (see table below). | | | | | | | | | | | | | | | | | | |
| Union of South Africa: | | | | | | | | | | | | | | | | | | |
| Cape Province | C | P | 1 | P | P | P | P | P | | P | P | P | P | | | | | |
| Municipality of East London | C | | P | | | | | 1 | | | | | | | | | | |
| Natal | C | P | 1 | P | P | P | P | P | P | | | P | P | | | | | |
| Orange Free State | C | P | P | P | P | P | P | P | | P | P | 12 | P | | | | | |
| Transvaal | C | P | P | P | P | P | P | P | | P | P | P | P | | | | | |
| Yugoslavia (see table below). | | | | | | | | | | | | | | | | | | |

[1] On Feb. 27, 1931, the Director General of Public Health of Guatemala reported an unusual outbreak of typhus fever in a small village in Guatemala.

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

### TYPHUS FEVER—Continued

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

| Place | | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 | July, 1931 |
|---|---|---|---|---|---|---|---|
| Chosen: Seoul | C | 124 | 3 | 4 | | 6 | |
| | D | 8 | | 1 | | 1 | |
| Czechoslovakia | C | 26 | | 5 | 11 | 2 | |
| Greece | C | 17 | 8 | 22 | 6 | 9 | 1 |
| | D | 2 | 1 | 3 | | | |
| Guatemala | C | | | | | 33 | 34 |
| | D | | | | | 15 | 5 |
| Latvia | C | 12 | | | | | |
| Lithuania | C | 3 | 99 | 34 | 10 | 13 | |
| | D | 1 | 3 | 5 | | 2 | |

| Place | | Feb., 1931 | Mar., 1931 | Apr., 1931 | May, 1931 | June, 1931 | July, 1931 |
|---|---|---|---|---|---|---|---|
| Mexico (see also table above) | D | 83 | | | | | |
| Turkey | C | 18 | 15 | | 3 | 3 | 2 |
| Union of Socialist Soviet Republics: | | | | | | | |
| Territories in Asia | C | 260 | | | | | |
| Ukraine | C | 419 | | | | | |
| Other territories in Europe | C | 1,373 | | | | | |
| Railroads, etc. | C | 158 | | | | | |
| Yugoslavia | C | 12 | 10 | 43 | 14 | 2 | 3 |
| | D | | 1 | 5 | | | |

### YELLOW FEVER

| Place | | Feb. 8–Mar. 7, 1931 | Mar. 8–Apr. 4, 1931 | Apr. 5–May 2, 1931 | May 3–30, 1931 | Week ended— June, 1931 | | | | July, 1931 | | | | August, 1931 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6 | 13 | 20 | 27 | 4 | 11 | 18 | 25 | 1 | 8 | 15 | 22 |
| Brazil: | | | | | | | | | | | | | | | | | |
| Alagoas State | C | | | | | | | | | | | | | | | 1 | |
| | D | | | | | | | | | | | | | | | 1 | |
| Bahia State | C | | 1 | | | | | | | | | | | | | | |
| Ceara State | C | | 2 | 2 | 1 | 1 | | | | | | | | | | | 1 |
| | D | | | 2 | 1 | | | | | | | | | | | | 1 |
| Minas Geraes State | C | | 2 | 5 | 2 | | | | | | | | | | | | |
| | D | | 1 | 2 | 1 | | | | | | | | | | | | |
| Rio de Janeiro State | C | 1 | 2 | | 2 | | | | | | | | | | | | |
| | D | 1 | 2 | | | | | | | | | | | | | | |
| Cambucy | C | 2 | 1 | | | | | | | | | | | | | | |
| | D | 1 | | | | | | | | | | | | | | | |
| Padua | C | 1 | | | | | | | | | | | | | | | |
| Sergipe State | C | | | | | | 1 | | | | | | | | | | |
| British Cameroons: Mamfe | C | | | | 3 | 1 | | 1 | | | | | | | | | |
| | D | | | | 2 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Colombia—Magdalena Province—near Cienaga | C | | | | | | | | | | | 4 | | | | | | |
| Gold Coast: | | | | | | | | | | | | | | | | | | |
| Akuse | C | | | | | | | | | | 2 | | | | | | | |
| | D | | | | | | | | | | 1 | | | | | | | |
| Dagomba District | C | | | | | | | | | | | | | 2 | | | | |
| Kintampo | C | | | | | | | | | | | 1 | | | | | | |
| | D | | | | | | | | | | | 1 | | | | | | |
| Tamale | C | | | | | | | | | | | | 2 | | | | | |
| | D | | | | | | | | | | | | 2 | | | | | |
| Wale Wale | C | | | | | | | | | | | | | 1 | | | | |
| | D | | | | | | | | | | | | | 1 | | | | |
| Ivory Coast: | | | | | | | | | | | | | | | | | | |
| Bobo Dioulasso | C | | | | | | | | | | | | 1 | | | | | |
| | D | | | | | | | | | | | | 1 | | | | | |
| Grand Bassam | C | | | | | | | | | | | | | 4 | | | | |
| Kong Circle | C | | | | | | | | | | | 4 | | | | | | |
| Seguela | C | | | | | | | | | | | | | | | | | P |
| Nigeria: Abakaliki | C | | | | | | | | | | | | | | | 1 | | |
| | D | | | | | | | | | | | | | | | 1 | | |
| Senegal: Podor (Hinterland) | C | | | | | | | | | | | | | | | | | 1 |
| | D | | | | | | | | | | | | | | | | | 1 |
| Sudan (French) | C | | | | | | | | | | | 4 | P | | | | | |
| Upper Volta: | | | | | | | | | | | | | | | | | | |
| Banfora | C | | | | | | | | | | | | 2 | | | | | |
| | D | | | | | | | | | | | | 1 | | | | | |
| Ouagadougou | C | | | | | | | | | | | | | | | | | 1 |