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EPIDEMIOLOGICAL STUDY OF PLAGUE IN PERU

WITH OBSERVATIONS ON THE ANTIPLAGUE CAMPAIGN AND LABORATORY WORK [1]

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The Epidemiology of Plague in Peru

OCCURRENCE OF PLAGUE

Introduction and spread.—Following the introduction of plague into the port of Callao in 1903, the disease spread rapidly north and south along the west coast of South America infecting most of the principal ports of Peru and Chile within a period of two years. From the ports the disease invaded inland communities of Peru and finally reached its greatest height in 1908, or six years after its introduction. In the 28 years from 1903 to 1930 over 20,000 human cases were officially reported from 193 towns and an unknown number of small farm communities. With the exception of a few short-lived outbreaks, plague has been confined to the narrow strip of seacoast Provinces extending the entire length of Peru and to adjacent mountain Provinces north of 12° south latitude.

Character of human plague epidemics from north to south.—North and south of a central coastal zone extending from 7° to 13° plague has only occurred in seaports and the larger towns and has not invaded the small isolated rural communities. North of Paita, which is located at 5° 6′ south latitude, plague has never gained a firm foothold in even the larger Peruvian ports. The incidence of human plague has been very high in the infected towns of the northern sector. In the northern Department of Piura the disease spread very slowly between railroad towns. North of 7° the epidemics have been severe but have shown a marked tendency toward voluntary disappearance which has actually taken place in the coast Provinces of the Department of Piura. In the southern sector, or colder area, plague epidemics have been mild and of short duration in the few places that have been infected with the exception of Mollendo.

[1] EDITOR'S NOTE.—This paper presents a summary of the most important parts of Surgeon Eskey's full report, which, owing to the length and the expense involved, could not be printed at this time.

The manuscript of the report was received for publication September 12, 1931.

In the central zone, where the mean monthly maximum temperatures of the warmer northern extremity rarely exceed 85° F., and the mean monthly minimum temperatures of the colder southern extremity are not below 55° F., plague has invaded the small isolated villages and small farming communities as well as the larger towns and cities. In the northern part of this zone the incidence of human plague has been greater both in the urban and rural communities than south of 9°. Plague has spread very rapidly in the central area and has shown a much greater persistence than in the zones north and south of it.

Plague in the mountain Provinces.—Plague has occurred only at high altitudes north of 12°. Some short, severe epidemics have been recorded at altitudes of over 9,000 feet above sea level in northern Peru. In the two mountain Provinces of the northern Department of Piura, plague has been continuously present among small isolated rural communities since 1922 and exists here absolutely independent of urban infection on the coast. Severe epidemics have been reported from towns and rural villages as far south as 8°, but south of the Department of Piura the prevalence of plague in the mountain Provinces appears to rise and fall with the epidemics on the coast. The epidemics south of 8° have been mild and plague has not been reported from haciendas located at high altitudes in this region.

Hacienda plague.—In the regions where plague has invaded haciendas, the disease has spread very rapidly from one point to another and has been very persistent. The morbidity rate has been greater on the haciendas than in the urban communities in the same districts. The greater prevalence of human plague has occurred on the haciendas of the Province of Trujillo, where sugarcane is the chief crop. In the southern part of the zone where plague has invaded haciendas, the incidence has been greatest in a valley where cotton is the only product, although the incidence has been quite high in regions where both cotton and sugarcane are raised. Very few cases have been reported from haciendas devoted to raising bananas and vegetables, and to dairy pastures. In the northern mountain Provinces and in the Province of Trujillo, plague infection of the rural districts is independent of any urban foci. In the northern and southern parts of the zone where plague occurs on haciendas, the rural cases follow the course of the urban epidemics; and it is probable that when the cities and towns of these regions are kept free from infection, the disease will disappear from the haciendas.

Course of human plague epidemics—The initial epidemics of plague have generally been much more severe than those occurring later in the same communities. Since plague reached its highest peak in 1908, the course of the annual epidemics has been irregular and without periodicity but has shown a general tendency toward reduced

Map showing coast towns and certain inland towns of Peru

severity in Peru as a whole and in its smaller political divisions. In urban communities where the initial epidemics were very severe, there has been a marked tendency toward voluntary disappearance. Reinfection has occurred in many communities and accounts for the more or less continued presence of the disease in a great many places. At Callao and Lima the initial epidemics were mild, but those of later years were more severe in comparison with the primary epidemics than in the towns of northern Peru. During the four years 1927–1930 the number of cases reported annually has only been about one-sixth as great as during 1908, although the infected towns reporting cases have been nearly as numerous as during the peak years, showing that there has been a much smaller number of cases from about the same number of foci.

Seasonal prevalence of human plague epidemics.—In all sections of Peru the annual plague epidemics tend to reach their greatest height during the summer months. Even when the winter temperatures of one community are about as high as the summer temperatures of another locality there is the same tendency in both places for the annual peak to occur during the summer months. The seasonal temperatures affect the curve of the annual epidemics to a certain degree, because, when the winter months are warm, the number of human cases begins to increase during the last winter month or early in the spring and reaches its highest point early in summer. In colder climates the annual rise does not begin until late in spring and the peak of the epidemics occurs late in summer. In the towns of northern Peru, where the morbidity rate has been high, there has been a more decided seasonal prevalence, because the epidemics have been short and violent; while at Callao and Lima there has been only a slight difference between the percentage of cases occurring during the summer and winter months.

Other factors besides the seasonal temperatures play a part in determining the seasonal prevalence of plague, for unseasonable epidemics have occurred in all parts of Peru, including Mollendo. Furthermore, the seasonal incidence of some rural communities is dependent on the crop seasons and varies considerably from that of towns in their immediate vicinity.

Effect of the annual climatic conditions on the prevalence of human plague.—In Lima and vicinity such changes as have been noted in the climatic conditions during the past 22 years have had no apparent effect one way or the other upon the number of human-plague cases reported annually. In the warmer northern section of Peru, particularly in the departments of Piura and Lambayeque, higher temperatures than normally occur probably reduce the prevalence of plague. The unusual rains of 1925 and 1926 were the cause of the widespread epidemic of 1926, which affected chiefly the small isolated communities in the northern mountain provinces and coast region.

Species of rats.—Rattus norvegicus, Rattus alexandrinus, Rattus rattus, and *Mus musculus* were the only rodents found in urban communities. In the rural districts near Lima, *norvegicus, alexandrinus,* and a small grayish field rat were caught. A few wild reddish-brown rats were caught in the mountain foot-hills near Lima. No rodents other than those named above were found in the urban or rural sections.

With the exception of the port of Pacasmayo, where over 99 per cent of the rats caught were *norvegicus, alexandrinus,* and *rattus* were the predominating species caught in the towns of northern Peru. In the central and southern coastal area *norvegicus* greatly exceeded the other species, except at the southern port of Mollendo where *rattus* and *alexandrinus* predominated.

Rat harborage in relation to species of rats.—The buildings of the warmer northern section of Peru are so constructed for protection against heat and occasional rains that they afford much greater rat harborage than do the buildings of the central and southern parts of Peru. In two ports, Paita and Mollendo, practically all buildings are of wooden construction and are notoriously rat-infested.

R. alexandrinus and *R. rattus* were the predominating species of rats caught in localities where the buildings offered the greatest harborage.

The sewer system of Lima, the banks of irrigation ditches and rivers, untreated garbage dumps, fields of cotton, sugar cane, corn, bananas, and vegetables, and orchards were all found to be prolific breeding places for *R. norvegicus. R. alexandrinus* formed about 25 per cent of the rats caught in fields. Over 99 per cent of the rats caught in sewers were *norvegicus,* but over a hundred *alexandrinus* and *rattus* were caught in the sewers of Lima. The lack of heavy rains and the moderate temperatures of Peru favor a large exterior rat population, which is limited only by the food and water supply.

Relations of rat harborage and species to the prevalence of human plague.—With one exception the prevalence of human plague has been much greater in the communities where the buildings offer the greatest rat harborage and the predominating species were *R. alexandrinus* and *R. rattus.* In the case of the northern port of Pacasmayo the incidence of plague has been very high, although over 99 per cent of the rats caught here were *norvegicus,* thus demonstrating that human plague may be as readily contracted from this species as from the other two. There is no doubt that the extent of the rat infestation of buildings has determined the morbidity rate of plague in the different communities from north to south in Peru regardless of differences in climatic conditions. Both ports, Paita and Mollendo, have suffered from severe epidemics of plague, although they are located well out-

side of the zone in which the climatic conditions are most favorable for the spread of this disease. As previously stated, the buildings of both places are heavily rat-infested. The presence of a very large exterior rat population and infested sewers has apparently not increased the plague morbidity rate of Lima and vicinity, as the prevalence of the disease there has been much lower at Lima than at the less favorably situated ports of Paita and Mollendo.

The fact that only a few places south of 13° latitude have been infected with plague and that the disease has never gained a firm foothold in any of them except Mollendo, shows that if the buildings are relatively rat proof, this infection can not be much of a menace to any community where climatic conditions are not particularly favorable and the transmitting agent is the same as in Peru.

Relation of Mus musculus to human plague.—The finding of a dead plague-infected mouse in the sleeping quarters from which two cases of plague had been removed is presumptive evidence that *Mus musculus* may be the direct source of human plague. Mice may be especially dangerous to man, because they may contract the infection from rats that are located in out-of-the-way places where man would not come in contact with them and bring the infection directly into the living rooms.

Dissemination of plague by rats.—Plague has been disseminated through the mechanical transportation of the infecting agents by vessels and railroads and by the migration of infected rats from one point to another or by the disease spreading through rats in the fields.

The disease was spread much more rapidly by sea than by railroads, which would indicate that rats themselves on infested vessels were a much greater menace in the dissemination of plague than the transmitting flea.

The rapid and wide-spread invasion of sea ports at which vessels handle cargo only at anchor shows that more stringent measures are demanded to prevent the introduction of plague than simply keeping vessels away from contact with wharves.

Whenever plague first appears at ports where conditions are favorable for severe epidemics or whenever exacerbations occur of existing epidemics, all places having commercial relations with such ports should take special precaution to prevent the introduction of plague. It is at such times, as shown by the spread of plague from the port of Callao, that the danger of the infection of ships is especially great, due to the widespread infection among the rats which is liable to result in their migration to vessels.

Relation of the rat to the course of human plague epidemics.—Epidemiological data collected in Peru point to the conditions under which rats are harboring in the different communities and the effect of plague upon the rat population as being the factors which determine

the course of human plague epidemics. The severity and extent of the initial epidemics have depended upon the extent of the rat infestation of buildings and the size of the communities. The greater the interior rat infestation, the more violent have been the initial epidemics and the exacerbations or reinfections during the first few years of infection.

The reduced incidence of plague, particularly as observed in the mildness of reinfections, after a community has not been infected for a few years, can not be explained except by assuming that the rats harboring in buildings have developed a lessened susceptibility to infection. Where the incidence of human plague has been low, as at Lima, the disease persisted for many years before there was any great reduction in the number of cases occurring annually, which is probably due to the fact that the rats in the buildings are fewer in number, to the lack of immunity among them, and to the constant invasion of buildings by sewer and other rats from exterior harboring places which have not been exposed to infection to the extent that have rats in the buildings.

Breeding season of rats.—A survey of pregnant rats made during the autopsy examination at Lima showed that a much larger percentage of females were pregnant from December to May than in June, the last fall month, indicating that probably the majority of rats are born in the warm months and reach mating maturity during the following spring.

Relation of the rat to the seasonal prevalence of plague.—There is no positive evidence that the breeding season of rats influences the seasonal incidence of plague, but it is possible that the mingling of rats during their mating in the spring may account, in part at least, for the increase in the prevalence of plague which begins during this season. In the case of rural communities where cotton is grown, the seasonal incidence of plague depends almost entirely upon the migratory movement of rats. The severe epidemics of plague which have occurred during the most unfavorable seasons of the year in practically all communities, regardless of their climates, show that the transmitting agents may be active at any time of year.

RELATION OF FLEA SPECIES TO PLAGUE

Varieties of fleas.—The following species of fleas were encountered in Peru: *Xenopsylla cheopis, Leptopsylla musculi, Ceratophyllus londiniensis, Rhopalopsyllus cavicola, Ctenocephalus felis, Echidnophaga gallinacea, Sternopsylla texanus, Hectopsylla* sp., and *Rhopalopsyllus litargus.*

Distribution of X. cheopis.—*X. cheopis* was the most common flea found on rats throughout the entire coast area of Peru. A few of this species were taken from guinea pigs, dogs, cats, opossums, and man.

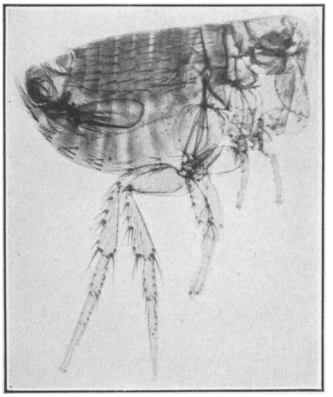
Relation of the harboring places of rats to the X. cheopis infestation.—The *X. cheopis* index was greater for rats caught in buildings or closely associated with buildings, in fields of cotton, sugarcane, and corn, and untreated garbage dumps. The infestation of the rats caught in the places named above was great enough to account for the spread of plague among them while the *X. cheopis* index of rats caught in sewers, along the banks of irrigation ditches and in orchards near Lima was lower than generally considered necessary for the propagation of plague epidemics. It appears probable that protected nesting places of rats in buildings, in untreated garbage dumps, and probably above-ground nests in fields, are necessary for the existence and multiplication of *X. cheopis* and that even in the climate of Lima, which is drier and more moderate than in most parts of the world, this species can not persist among sewer rats and rats living in underground burrows.

X. cheopis infestation of species of rats.—The *X. cheopis* index of the total *R. alexandrinus* and *R. rattus* caught was greater than that of *R. norvegicus*, but if the index is computed for only the rats which were found to be flea-infested, it will be found to be greater in the case of *R. norvegicus*.

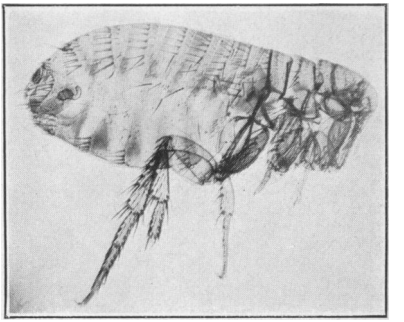
Relation of temperature to X. cheopis infestations.—In order to form any conclusion of value regarding the effect of climate or temperature upon the *X. cheopis* index it is necessary to compare the indices of rats caught in similar types of harboring places during the different months. As the exterior temperatures of Lima throughout the year are within the range required for the existence of *X. cheopis* the index can not be expected to vary greatly during the different seasons. During the warmer months there was apparently a slight reduction in the *X. cheopis* index which increased with the onset of colder weather in May. This reduction was probably due to the fleas spending less time on their hosts during the warmer months and not to an actual reduction in the number of *X. cheopis* in the community.

Relation of X. cheopis infestation to city zones.—No evidence was found indicating that the *X. cheopis* index varied within the different city zones which were devoted to commercial purposes or residences. When the majority of rats were caught within buildings the index was always high regardless of the nature of the city zone in which they were caught.

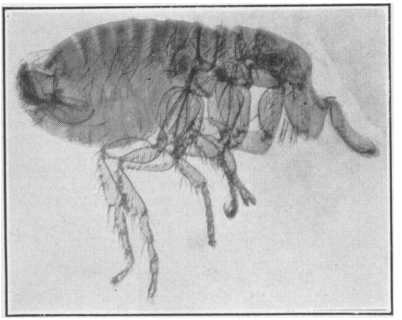
Percentage of X. cheopis females.—The data collected during this survey suggest that when 50 per cent or more of the *X. cheopis* found on rats are females the climatic conditions or the harboring places in which rats are caught are not as favorable to the existence of these fleas as when the percentage of females is below 50 per cent.



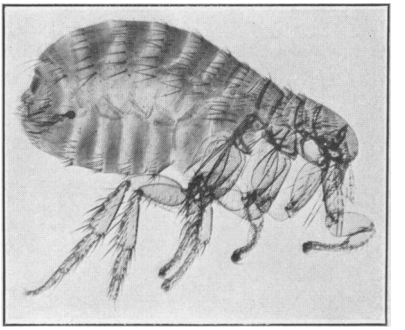
Rhopalopsyllus litargus (male)



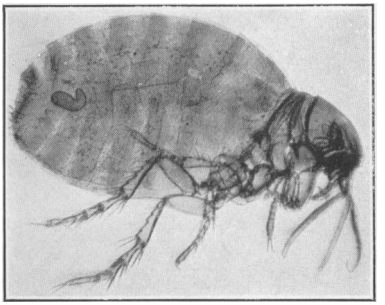
Rhopalopsyllus litargus (female)



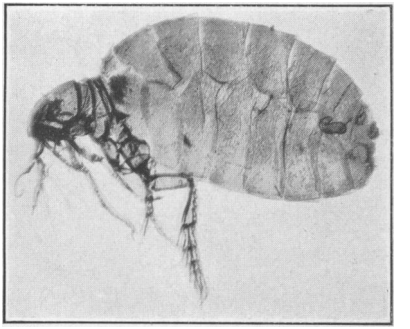
Rhopalopsyllus cavicola (male)



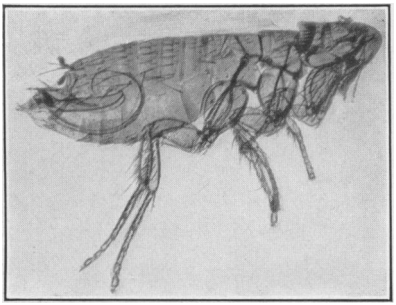
Rhopalopsyllus cavicola (female)
(From guinea pigs)



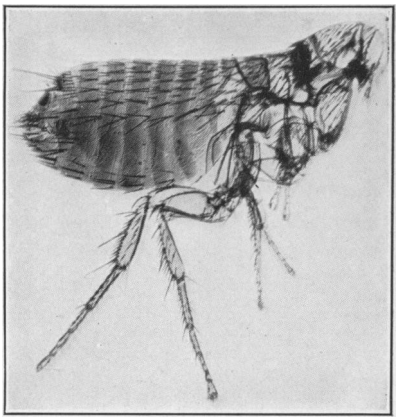
Hectopsylla sp. (female; unfertilized form)



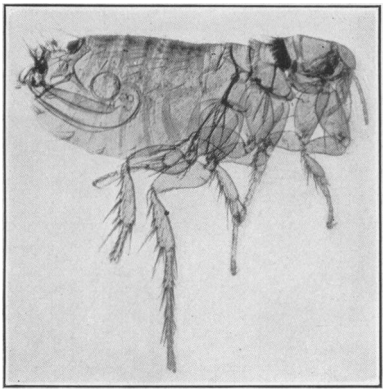
Hectopsylla sp. (female; older form)



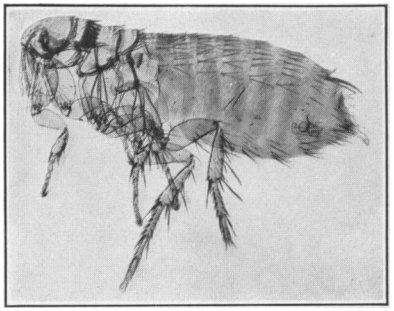
Leptopsylla musculi (male)



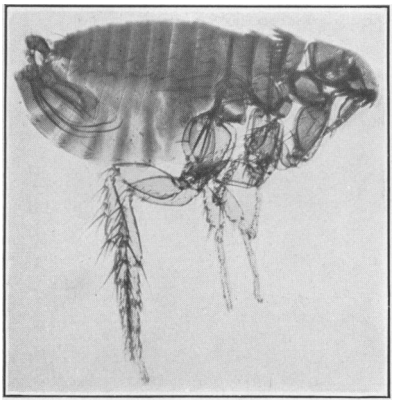
Leptopsylla musculi (female)



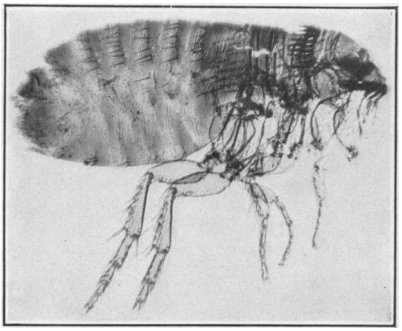
Ceratophyllus londiniensis (male)



Ceratophyllus londiniensis (female)



Ctenocephalus felis (male)



Ctenocephalus felis (female)

Length of life of unfed X. cheopis.—The average length of life of 14 unfed *X. cheopis* was found to be between four and five days when the mean temperature was 63.3° F. and the relative humidity very high. One unfed female did not die until between the seventh and eighth days.

X. cheopis infestation of Mus musculus.—The *X. cheopis* infestation of *Mus musculus* was lower than is considered to be required for the continuous transmission of plague among these animals, as only one *X. cheopis* was found to every five mice examined.

Relation of X. cheopis to plague in Peru.—As a result of the flea survey conducted at different points along the coast, and in view of the distribution of plague among the isolated rural communities or in the region in which the disease occurs among migratory field rats, and considering the fact that the disease has been confined to the warmer mountain provinces adjacent to the infected coast area, it can be reasonably concluded that *X. cheopis* is probably the only transmitting agent responsible for the continuous and severe epidemic of plague that has occurred in Peru since the introduction of the disease in 1903. It is possible but doubtful that some other agent is active in the transmission of plague in the mountain provinces.

Significance of the X. cheopis index.—In order for the *X. cheopis* index to have any significance in the epidemiology of plague it must be studied in connection (1) with the degree of interior rat infestation, (2) the source from which the rats are caught, and (3) the season of the year. Rats caught in buildings of communities located where climatic conditions, as determined by exterior temperatures, are unsuitable for the existence of *X. cheopis*, may have a higher index than those found in more favorably situated localities. The index may be high for a few rats caught within buildings in places such as Pisco, where plague has been unable to gain a firm foothold.

Relation of other parasites to plague.—Of the other parasites found on rats and mice in Peru only two, *Pulex irritans* and bed bugs, are believed to be agents which may possibly transmit human plague. Even though these two parasites may be accountable for some cases of human plague, the disease would not persist if it depended upon them alone.

SUMMARY

The greatest incidence of plague per thousand population in towns and cities in Peru occurred in the communities in which the rat harborage of buildings was greatest regardless of the climatic location of the towns within or outside the zone most favorable to the existence of the chief transmitting agent, *X. cheopis*. It is doubtful whether the low incidence or even complete absence of human plague due to relative rat-proof construction of buildings could be better illustrated

than by the findings in central and southern Peru. It is desired to emphasize that in most parts of the world where *X. cheopis* is the transmitting agent, plague could never exist in epidemic form if the buildings were so constructed and maintained that the rat population within them was reduced to a minimum. There are few countries in which lack of rainfall, high humidity, and moderate temperatures furnish as favorable conditions for the existence of *X. cheopis*, and also exterior harborage of rats, as are found in Peru, yet even the relative rat-proof construction of buildings here has reduced and prevented the establishment of plague in many coast towns.

Notes on the Antiplague Campaign in Peru and Laboratory Work

INTRODUCTION

The discussion of the epidemiology of plague in Peru has shown that the complete eradication of plague from that country will be difficult to accomplish. The problem presented in antiplague work where the infection is confined to towns and cities is much simpler than that connected with the eradication of plague from among rats that infest the fields. In urban areas some idea may be gained regarding the location of infected foci by catching infected rats and through human cases reported. In fighting the disease among rats that migrate in accordance with crop seasons, immense areas have to be covered, because it is impossible to tell just where the disease is smouldering. The presence of human cases on an hacienda indicates that the rats in that vicinity are infected, but there is no means of telling in what other directions the disease is spreading until another hacienda is invaded.

In certain sections of Peru where plague spreads through migratory rats it should be possible to keep the number of human cases in the towns and haciendas at a very low figure by constant work, but the disease can not be completely conquered until it has been eradicated from the reservoir among the migratory rats. In other areas it will probably disappear from the field rats if the urban centers are kept free from infection for some time so that the rats can not carry the disease back and forth in their migrations.

The presence of a large exterior rat population, such as that found in the sewers and along the irrigation ditches of Lima, which has probably been more or less immune to the spread of plague because of their slight *X. cheopis* infestation, is believed to complicate the eradication of the infection as well as prolonging the disease. When these animals leave their natural hiding places and invade buildings where infected fleas are present, they easily succumb to the disease, thus prolonging its existence.

ORGANIZATIONS AND METHODS EMPLOYED

The organization of personnel and methods employed in the antiplague campaign in Peru were practically the same as those used in Ecuador during 1929 and 1930, so that they will be discussed very briefly.

The antiplague campaign was carried out under the direction of Medical Director John D. Long, of the United States Public Health Service. All personnel were trained at Lima before being sent to outlying Provinces. Assistant epidemiologists were stationed in the principal ports to supervise the trapping and poisoning of rats, to collect fleas, and to inoculate guinea pigs with material from the rats caught each day in order to determine the presence of infection in each place. Poison was relied upon to reduce the rat population, and trapping was instituted because of the value of the information thus obtained regarding the presence of plague and the flea infestation of rodents. The number of rats caught was not large except at Lima, where over 25,000 were caught. All towns and most of the haciendas were poisoned from one to four times in the districts where plague had been reported during the preceding five years. Certain mountain communities were not treated. Over 70 tons of poison put up in small paper packages was distributed in over 100 towns and their surrounding haciendas.

Arsenic used in paper packages with various sorts of bait has continued to be effective in the destruction of rodents and free from danger of accidental poisoning. Not a single instance of human poisoning was reported, and only a few domestic animals were alleged to have been killed by arsenic. Care must be exercised in the distribution of poison made with corn or other cereals where there are calves, burros, pigs, chickens, and other domestic animals.

RESULTS OBTAINED UP TO JUNE 30, 1931

Active antiplague measures began at Lima and Callao in November, 1930, and in other Provinces during the following December and January. The time which has elapsed since the institution of the work is too short to make any definite statements regarding the permanency of the results obtained or what can be expected from its continuation. Certainly the complete eradication of plague from a country in which the disease has so many ramifications and is so firmly established as in Peru can not be expected in a few months.

If the reduction which has taken place in the number of human cases reported since the campaign began is an index of its effectiveness, it must be conceded that the results obtained in the first six months of 1931 have been very good. There were only 97 cases of plague reported in 1931 from January to June, inclusive, or during the season

when the disease reaches its highest annual peak. This number is the smallest ever recorded during a similar period and about 45 per cent less than that reported in the first six months of 1927, when the incidence was the lowest ever previously reported. In December, 1930, there were 78 cases of plague; and instead of the usual seasonal increase occurring during the first months of 1931, there was a very marked reduction in the prevalence of the disease.

The incidence of plague in Lima was most certainly reduced by the measures instituted, but the disease had not been completely eradicated by June, as shown by the occurrence of three cases in a small section of the city near the large central market. The fact that there was no evidence of plague among over 7,000 rats autopsied from March 15 to June 15, and that no human cases were reported during the same period, might be considered evidence that the recent cases were due to a reinfection of the city from an outside source. The presence of a case of plague on a hacienda not far from the infected part of Lima rather supports the idea that reinfection might have come from rats returning to the city shelter with the onset of the damp cool weather in June.

In conclusion it can be stated that there has been a great reduction in the incidence of plague in Peru since the beginning of the anti-plague campaign and that the use of poison for the destruction of rats has apparently yielded very good results. Peru is not yet free from plague; the work has only begun, and it must be continued for a long time to attain permanent results. The disease will probably reappear in many places that are free from infection now should the work cease or become lax. Whether or not plague can be entirely eliminated from the migratory rats in the rural districts within a reasonable time remains to be demonstrated.

STATUS OF PLAGUE IN PORTS

The last case of human plague reported from a Peruvian port was recorded at Huacho in March, 1930, and there have been no infected rats caught at the principal ports where assistant epidemiologists are stationed since the same month. The last human case reported at Callao, the principal port, was notified in May, 1930, or over a year ago. About 5,000 rats, that were caught at Callao from November, 1930, to June 30, 1931, were inspected at the laboratory in Lima without finding a single one plague-infected. Callao is the only port at which vessels go alongside of wharves in Peru.

Most Peruvian ports are surrounded by arid, barren territory, and so the presence of plague among rats in the fields is not as great a menace to them as to the towns which are situated in the irrigated districts.

FEEDING AND POISONING EXPERIMENTS

Many combination feeding and poisoning experiments using about 40 *R. norvegicus* caught in sewers were carried out at the laboratory to determine what local inexpensive substance would be most effective as a bait for poisoning rats. The details of these experiments are too long for complete discussion so that only some of the conclusions will be noted here.

Hungry rats will eat almost anything; but when there is a variety of food available, they are very selective in their choice. Therefore, an effective poison must be one that rats will eat when there is other food at hand. In all feeding and poisoning experiments, from seven to nine different combinations of substances were used at one time besides the ones experimented upon. The foods were put up in small marked paper packages of the same type as that used for poison throughout the plague campaign. Rats almost invariably selected and opened packages containing rice and corn first. Many would eat only these two cereals when they were present. The addition of ground dried fish, cheese, shrimp, anise oil, and other substances used for the purpose of attracting rats were found to be of no value whatsoever. It was finally decided that plain cornmeal was the best inexpensive bait that could be obtained in Lima for mixing with arsenic in making rat poison. Rats preferred coarse corn to very fine corn flour; therefore the cornmeal should be ground as coarse as possible and yet mix with arsenic.

It is believed that prior to the use of poison in any community a few rats should be caught and fed mixtures of the different cheap foods that can be purchased in the local market. In this way a better decision can be made regarding the foods most suitable for poison mixtures. Each rat should be fed in a separate compartment or cage.

Thirty rats were killed with arsenic. The length of life depended more or less upon the amount of poison consumed. Some rats died in less than 24 hours after eating about one-tenth of a poison package. Only eight rats died in less than 24 hours. One that ate three poison packages died in three hours. Twenty-three rats died in less than four days. One rat did not die until the 18th day after taking poison. Autopsy of this animal showed the pathology of arsenic poison. Six rats apparently recovered after being sick a few days.

Many of the poisoned rats were very vicious when sick and would attack anything placed in their jars. It is possible that this symptom of arsenic poisoning is of value in antiplague work. Many people have reported that they have observed rats chasing each other about, even in the daytime, and others have noted a great disturbance among rats in double walls after the distribution of poison. It seems that the sick aggressive rats may chase the other rats away from their usual flea-infested hiding places and cause them to seek new ones,

thus reducing their flea infestation. The vicious rats may also kill other rats.

ARSENIC POISONING OF EMPLOYEES

In Guayaquil, Ecuador, large quantities of arsenic were made into poison mixtures without any ill effects being noted among those working with it. But, at Lima, during the first four months there was constant disability among those connected with the mixing of the poison and preparation of the small paper packages. Individuals that had small cuts on their hands would develop indolent ulcers and many were incapacitated by large areas of pustules which affected almost any part of the body, but were most severe in the axilla and inguinal regions because of the more profuse perspiration. Both the ulcers and pustules would disappear in a few days when the individuals were removed from their exposure to arsenic. No fatal or serious cases of poisoning occurred.

In April a purer arsenic, one containing less than 1 per cent of impurities, was purchased, and following its use there was no trouble with dermatitis until another shipment of the impure arsenic arrived. The impure arsenic was a dark gray, Japanese product. It was found more suitable for mixing with bait because it was more adherent than was the pure white arsenic, which tended to settle out. The adherent property of the impure arsenic was probably the cause of so much dermatitis and special precautions are necessary when it is used.

HANDLING DEAD RATS

Trappers were furnished with small metal boxes with tightly fitting caps in which they collected their dead rats. At the doorway of the laboratory they emptied the contents of their boxes into a large flat pan containing about one-half inch of cresol solution. The rats were classified while in the pan and then thoroughly dipped in a large can filled with 5 per cent cresol solution. There are a great many fleas on rats caught in snap traps and brought to the laboratory dead, but after this treatment they are not dangerous. Some fleas may struggle off the rats onto the boards to which the rats are tacked, but they soon die and none were ever observed to jump.

AUTOPSY INSPECTION OF RATS

The rats were tacked to boards which were given the number of the trappers' district where the rats were caught. For making the macroscopical examinations a complete exposure was made of the thoracic and abdominal vicera, and the skin was dissected back exposing the cervical, axillary, and inguinal gland areas. Although a careful inspection was made of every rat autopsied, only one suspicious rat was detected, which was proved to be plague-infected by

guinea pig inoculation. This rat had enlarged congested inguinal glands, but no other macroscopical evidence of plague. The microscopical examination of the gland smear showed the presence of suspicious organisms, but none was found in smears from the spleen and liver.

The daily inspection was checked by a mass inoculation into a guinea pig of an emulsion made from small pieces of spleens and livers collected from all autopsied rats. Four guinea pigs died of plague as a result of these inoculations. The condition had not been detected at autopsy inspection. It is believed essential that daily mass inoculations be made if the work of a plague laboratory is done thoroughly.

CHRONIC PLAGUE

There was absolutely no pathology observed among autopsied rats to indicate the presence of the condition known as chronic plague. It was not uncommon to find rats with rather thick adhesions between the stomach and spleen and the abdominal wall. At first it was thought that these adhesions were possibly the result of an old plague infection, but one of the rats that died of experimental plague had this pathology.

CARE OF PLAGUE-INOCULATED GUINEA PIGS

During the nine months of this investigation many guinea pigs infected with plague were handled at the laboratory. The animals were kept in open glass jars 11 inches in diameter and 16 inches deep. No cover was placed over the jars, and the only precaution taken to prevent the escape of fleas was a band of ordinary axle grease about 2 inches wide on the inside of the top of the jars. The guinea pigs did not escape from the jars, nor was there any infection of other guinea pigs in close proximity that could in any way be assigned to fleas passing from one animal to another. The guinea pigs were kept under observation for 14 days.

AN ATYPICAL CASE OF PLAGUE AND AN UNUSUAL REACTION OF A PLAGUE-INFECTED GUINEA PIG

About June 16, 1931, a Japanese was taken sick with fever and pain in one inguinal region. He remained at his home for a few days; then, upon the advice of a friend, he went to Callao for treatment at a hospital. He was not well but was able to walk about fairly comfortably. The physician who saw him at Callao sent him to the plague hospital in Lima. He was visited the next day, and upon examination he was found to have an ulcer on the frenum of the penis and an enlarged, somewhat tender, softening inguinal gland. He did not appear to be very sick and his temperature was only 38.3° C. A smear

was made from the softening area of the inguinal gland and a guinea pig was inoculated by hypodermic injection. Microscopical examination of the smear revealed a few suspicious plague-like organisms, but even then the case was thought to be venereal.

June 25, 1931, another Japanese was sent to the plague hospital from the same room as that occupied by the first one. This case was more typical of plague. A guinea pig was inoculated and bipolar organisms were found in the smear from the enlarged glands.

June 26, 1931, a dead mouse found in the room occupied by the two Japanese was brought to the laboratory. Smears from the spleen and liver of the mouse showed many typical coccobacilli. A guinea pig was also inoculated through the shaved skin.

The guinea pigs inoculated from the second case and the mouse died between the third and fourth days of plague. The guinea pig inoculated from the first Japanese appeared to be sick for several days. As there were no indications that it would die, it was killed on the tenth day because of the positive findings in the other case. Autopsy revealed the following macroscopical pathology: There was an abscess the size of a large bean at the site of the hypodermic inoculation. The glands in both inguinal regions were enlarged, somewhat hemorrhagic in appearance, matted together, and some pus was present in them. The liver was greatly enlarged and contained numerous small, yellowish white, slightly raised abscesses, somewhat larger than a pin head. The spleen was slightly enlarged, rough in appearance, and also contained many small abscesses similar to those found in the liver, as well as a larger abscess about the size of a pea. A number of slides were prepared from the liver, spleen, and glandular masses. In one smear from the spleen three or four suspicious organisms were found. The remainder of the slides were all negative. Macroscopically this guinea pig appeared to be plague-infected, but the microscopical findings were too indefinite for a positive diagnosis. Two other guinea pigs were inoculated and both were found to be plague-infected. One of these animals was killed the third day after inoculation and coccobacilli were found in the inguinal glands but not in the liver and spleen. In this connection it is desired to mention that *Bacillus pestis* have been recovered in large numbers from the glands of a guinea pig 24 hours after inoculation.

The first human case illustrates how closely an ambulatory case of plague may simulate venereal inguinal adenitis, especially with a venereal ulcer present. If it had not been for the second case and the infected mouse, the guinea pig inoculated from the first case would not have been killed as it was and probably would have recovered. It seems that the best procedure would be to kill all inoculated guinea pigs on the sixth or seventh day after inoculation, especially if they

have shown any signs of sickness. If this guinea pig had been killed sooner, there would probably have been an abundance of typical organisms in all smears.

Acknowledgments

It is desired to express thanks and acknowledge the great assistance rendered in the collection of the data contained in this report by Dr. Benjamin Mostajo, Dr. Nicholas E. Cavassa, and the staff of the laboratory.

DEATHS DURING WEEK ENDED OCTOBER 29, 1932

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

	Week ended Oct. 29, 1932	Corresponding week, 1931
Data from 85 large cities of the United States:		
Total deaths	7,249	7,512
Deaths per 1,000 population, annual basis	10.3	10.9
Deaths under 1 year of age	487	609
Deaths under 1 year of age per 1,000 estimated live births [1]	40	47
Deaths per 1,000 population, annual basis, first 43 weeks of year	11.1	11.9
Data from industrial insurance companies:		
Policies in force	70,081,265	74,425,301
Number of death claims	12,742	11,828
Death claims per 1,000 policies in force, annual rate	9.5	8.3
Death claims per 1,000 policies, first 43 weeks of year, annual rate	9.6	9.7

[1] 1932, 81 cities; 1931, 77 cities.

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 November 5, 1932, and November 7, 1931

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended November 5, 1932, and November 7, 1931

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931
New England States:								
Maine	2	5	4	2	2	171	0	0
New Hampshire	----	8	----	----	----	15	0	0
Vermont	----	12	----	----	1	66	0	0
Massachusetts	29	61	4	4	56	62	1	6
Rhode Island	4	11	----	----	----	105	1	0
Connecticut	6	5	----	4	2	12	0	0
Middle Atlantic States:								
New York	56	68	[1] 6	[1] 5	241	145	7	8
New Jersey	34	34	9	5	74	19	3	1
Pennsylvania	93	104	----	----	124	205	2	4
East North Central States:								
Ohio	95	164	18	13	88	50	0	1
Indiana	64	94	36	1	9	74	3	0
Illinois	114	172	10	8	54	30	4	3
Michigan	25	63	10	----	158	21	0	7
Wisconsin	11	30	18	14	87	14	0	3
West North Central States:								
Minnesota	12	14	2	3	48	8	0	3
Iowa	25	10	5	----	4	5	0	3
Missouri	105	94	----	14	3	7	0	3
North Dakota	2	3	----	----	31	2	0	0
South Dakota	2	4	1	----	3	2	1	1
Nebraska	37	18	----	8	1	12	0	0
Kansas	35	112	1	3	10	24	1	0
South Atlantic States:								
Delaware	8	33	----	----	----	----	0	0
Maryland [2]	26	47	8	10	1	3	2	1
District of Columbia [2]	8	13	----	----	1	1	0	0
Virginia	62	----	----	----	34	----	0	----
West Virginia	40	95	----	22	29	106	1	1
North Carolina [3]	96	237	8	25	96	60	1	2
South Carolina	25	39	401	289	4	17	0	0
Georgia [3]	88	56	----	57	2	5	0	1
Florida [2]	25	32	1	1	1	7	0	0
East South Central States:								
Kentucky	86	219	85	----	37	----	3	1
Tennessee	101	151	41	31	5	3	0	2
Alabama	70	134	34	9	1	4	0	1
Mississippi	41	104	----	----	----	----	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended November 5, 1932, and November 7, 1931—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931
West South Central States:								
Arkansas	40	82	21	17	2	----	0	0
Louisiana [3]	38	36	9	10	2	15	0	1
Oklahoma [4]	105	137	----	22	1	4	3	0
Texas	175	84	59	11	4	11	0	1
Mountain States:								
Montana	----	2	----	----	79	71	0	0
Idaho	3	2	----	----	----	----	0	0
Wyoming	----	----	----	----	2	1	0	0
Colorado	14	4	----	----	9	4	1	0
New Mexico	26	21	275	----	----	----	1	0
Arizona	4	12	21	----	4	----	0	0
Utah [2]	1	----	4	4	----	----	0	0
Pacific States:								
Washington	4	13	----	4	----	38	0	1
Oregon	3	3	32	43	25	5	1	0
California	66	106	358	41	27	168	2	2
Total	1,906	2,748	1,481	680	1,362	1,572	39	57

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931
New England States:								
Maine	7	5	15	32	0	0	6	5
New Hampshire	0	0	20	7	0	0	0	0
Vermont	0	4	3	11	0	22	0	0
Massachusetts	0	19	206	195	0	0	4	4
Rhode Island	0	0	29	16	0	0	0	0
Connecticut	0	17	54	27	0	0	4	4
Middle Atlantic States:								
New York	5	74	294	336	3	19	17	28
New Jersey	6	15	121	113	0	0	5	4
Pennsylvania	20	17	356	318	0	0	36	61
East North Central States:								
Ohio	4	4	419	335	22	11	19	39
Indiana	0	3	103	113	1	9	4	3
Illinois	4	33	315	287	1	19	19	14
Michigan	1	22	201	160	0	2	12	11
Wisconsin	1	23	78	71	3	0	4	3
West North Central States:								
Minnesota	3	30	44	41	2	2	1	0
Iowa	6	10	27	42	7	49	1	4
Missouri	0	3	153	92	0	3	7	13
North Dakota	1	3	4	10	2	12	1	5
South Dakota	1	2	6	6	0	2	0	2
Nebraska	0	0	45	26	0	3	5	2
Kansas	1	1	84	70	0	2	5	0
South Atlantic States:								
Delaware	0	0	6	7	0	0	0	2
Maryland [3]	4	2	77	78	0	0	7	30
District of Columbia [3]	1	0	11	22	0	0	2	5
Virginia	1	2	101	----	0	----	14	----
West Virginia	1	1	70	98	0	0	27	32
North Carolina [3]	3	6	115	195	0	2	11	22
South Carolina	1	1	18	17	0	1	8	10
Georgia [3]	0	0	16	43	0	0	19	16
Florida [3]	0	0	1	4	0	0	1	4
East South Central States:								
Kentucky	1	1	74	90	3	6	23	42
Tennessee	4	1	99	93	1	6	18	33
Alabama	0	0	54	53	0	0	11	19
Mississippi	1	2	46	43	2	10	5	12

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended November 5, 1932, and November 7, 1931—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931	Week ended Nov. 5, 1932	Week ended Nov. 7, 1931
West South Central States:								
Arkansas	1	0	19	48	0	7	13	15
Louisiana [3]	0	2	26	23	0	1	8	18
Oklahoma [4]	1	0	34	39	0	9	18	29
Texas	1	0	64	48	2	0	16	17
Mountain States:								
Montana	0	1	4	17	3	1	3	2
Idaho	0	0	3	4	8	0	2	1
Wyoming	0	0	17	5	0	0	0	0
Colorado	1	0	46	23	0	0	1	18
New Mexico	0	0	11	10	0	0	1	9
Arizona	0	0	6	9	0	1	3	5
Utah [2]	0	0	10	12	0	0	0	0
Pacific States:								
Washington	2	2	21	58	2	10	9	3
Oregon	1	0	25	16	0	5	5	4
California	5	3	119	123	5	7	8	5
Total	83	309	3,670	3,486	67	221	383	555

[1] New York City only.
[2] Week ended Friday.
[3] Typhus fever, week ended Nov. 5, 1932, 19 cases; 1 case in District of Columbia, 1 case in North Carolina, 15 cases in Georgia, 1 case in Florida, and 1 case in Louisiana.
[4] Figures for 1932 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
August, 1932										
Hawaii Territory	-------	13	1,070	-------	1	-------	0	1	0	1
Puerto Rico	-------	54	4,097	3,571	193	2	0	-------	0	9
September, 1932										
Kansas	1	85	5	-------	23	-------	9	196	0	37
Nevada	-------	-------	-------	-------	1	-------	0	3	0	0
Wisconsin	3	48	80	-------	104	-------	8	106	4	21
October, 1932:										
Arkansas	-------	169	115	256	10	48	3	116	0	56
Connecticut	2	13	13	-------	26	-------	3	130	0	11
Florida	-------	83	10	24	5	3	2	30	0	10
Iowa	3	97	-------	-------	7	-------	7	164	11	41
Nebraska	1	135	10	-------	21	-------	8	174	13	4

August, 1932

	Cases
Chicken pox:	
Hawaii Territory	8
Puerto Rico	36
Colibacillosis:	
Puerto Rico	4
Conjunctivitis, follicular:	
Hawaii Territory	2
Dysentery:	
Puerto Rico	18
Filariasis:	
Puerto Rico	8
Hookworm disease:	
Hawaii Territory	18
Impetigo contagiosa:	
Hawaii Territory	1
Leprosy:	
Hawaii Territory	4
Puerto Rico	3
Mumps:	
Hawaii Territory	2
Puerto Rico	16
Ophthalmia neonatorum:	
Puerto Rico	5
Plague:	
Hawaii Territory	1
Puerperal septicemia:	
Puerto Rico	16
Tetanus:	
Puerto Rico	6
Tetanus, infantile:	
Puerto Rico	33
Trachoma:	
Hawaii Territory	1
Puerto Rico	4
Undulant fever:	
Hawaii Territory	1
Whooping cough:	
Hawaii Territory	11
Puerto Rico	105
Yaws:	
Puerto Rico	3

September, 1932

	Cases
Botulism:	
Kansas	1
Chicken pox:	
Kansas	47
Wisconsin	184
German measles:	
Kansas	11
Wisconsin	14
Impetigo contagiosa:	
Kansas	1
Lethargic encephalitis:	
Wisconsin	2
Mumps:	
Kansas	40
Wisconsin	69
Paratyphoid fever:	
Kansas	1
Ptomaine poisoning:	
Kansas	1
Scabies:	
Kansas	2
Septic sore throat:	
Kansas	3
Tetanus:	
Kansas	4
Tularæmia:	
Nevada	1
Wisconsin	2
Undulant fever:	
Kansas	7
Wisconsin	2
Vincent's angina:	
Kansas	4
Whooping cough:	
Kansas	74
Nevada	2
Wisconsin	469

October, 1932

	Cases
Chicken pox:	
Arkansas	14
Connecticut	135
Florida	2
Iowa	207
Nebraska	88
German measles:	
Iowa	2
Hookworm disease:	
Arkansas	4
Connecticut	1
Impetigo contagiosa:	
Iowa	10
Lead poisoning:	
Connecticut	1
Lethargic encephalitis:	
Iowa	1
Mumps:	
Arkansas	54
Connecticut	156
Florida	1
Iowa	27
Nebraska	29
Ophthalmia neonatorum:	
Arkansas	1
Connecticut	1
Rabies in animals:	
Connecticut	4
Septic sore throat:	
Connecticut	3
Iowa	3
Nebraska	11
Tetanus:	
Connecticut	1
Trachoma:	
Arkansas	3
Tularæmia:	
Florida	1
Typhus fever:	
Connecticut	1
Florida	1
Undulant fever:	
Connecticut	1
Florida	1
Iowa	3
Whooping cough:	
Arkansas	23
Connecticut	194
Florida	24
Iowa	34
Nebraska	25

WEEKLY REPORTS FROM CITIES

City reports for week ended October 29, 1932

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	-------	1	0	1	1	0	1	0	3	24
New Hampshire:											
Concord	0	-------	0	0	0	0	0	0	0	0	9
Nashua	0	-------	0	0	0	0	0	1	0	0	-------
Vermont:											
Barre	0	-------	0	0	0	0	0	0	0	0	2
Burlington	0	-------	0	1	0	1	0	0	0	0	12
Massachusetts:											
Boston	4	1	0	11	11	49	0	8	1	33	189
Fall River	1	1	0	0	0	7	0	1	6	2	24
Springfield	4	-------	0	0	1	7	0	2	0	1	34
Worcester	3	-------	0	0	6	9	0	3	1	0	55
Rhode Island:											
Pawtucket	0	-------	0	0	1	0	0	0	0	0	13
Providence	4	-------	0	0	1	8	0	1	0	3	61
Connecticut:											
Bridgeport	2	-------	0	4	4	4	0	0	0	2	30
Hartford	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
New Haven	0	1	0	0	5	5	0	0	0	6	40
New York:											
Buffalo	3	-------	0	1	11	21	0	4	0	19	114
New York	15	14	6	46	100	54	0	77	10	96	1,303
Rochester	2	-------	0	2	5	9	0	0	0	1	53
Syracuse	0	-------	0	2	1	6	0	0	1	5	40

City reports for week ended October 29, 1932—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
New Jersey:											
Camden	9		0	0	2	1	0	0	0	7	20
Newark	1	3	0	7	3	4	0	5	1	12	98
Trenton	3		0	0	3	15	0	1	1	9	28
Pennsylvania:											
Philadelphia	7	3	2	2	18	36	0	18	4	11	401
Pittsburgh	13	1	1	0	19	40	0	7	3	18	145
Reading	1		0	11	1	2	0	1	0	4	29
Scranton	2			2		4	0		0	11	
Ohio:											
Cincinnati	5		0	0	6	16	0	2	1	1	108
Cleveland	5	44	0	1	10	37	0	11	2	21	174
Columbus	9	2	2	44	1	24	0	1	0	0	47
Toledo	5	1	1	2	3	29	0	5	1	3	57
Indiana:											
Fort Wayne	10		1	0	0	1	0	0	0	0	18
Indianapolis	6		0	0	8	15	0	2	1	5	
South Bend	0		0	0	2	6	0	0	0	0	13
Terre Haute	0		0	2	1	2	0	0	1	0	15
Illinois:											
Chicago	17	2	2	23	33	94	0	41	2	26	601
Springfield	4	1	0	2	0	12	0	3	0	0	16
Michigan:											
Detroit	11	1	0	24	9	44	0	18	0	69	194
Flint	1	3	1	0	1	5	0	1	0	3	23
Grand Rapids	0		0	1	2	2	0	1	0	22	26
Wisconsin:											
Kenosha	0		0	0	0	2	0	0	0	0	4
Madison	2			1		0	0		0	0	
Milwaukee	2	1	1	3	2	5	0	4	0	17	92
Racine	0		0	0	0	0	0	1	0	3	7
Superior	1		0	0	0	1	0	0	0	0	13
Minnesota:											
Duluth	0		0	0	2	3	0	0	0	0	17
Minneapolis	2		0	12	6	12	0	2	4	3	89
St. Paul	2		0	0	7	11	0	4	1	17	64
Iowa:											
Des Moines	15			0		8	0		0	0	45
Sioux City	5			0		0	1		0	0	
Waterloo	0			1		0	0		0	2	
Missouri:											
Kansas City	8		0	3	5	21	0	4	0	2	74
St. Joseph	7		0	2	1	4	0	1	0	1	19
St. Louis	29		0	2	4	25	0	4	8	2	193
North Dakota:											
Fargo	0		0	0	1	0	0	0	0	0	3
Grand Forks	0		0	15	0	0	0	0	0	0	
South Dakota:											
Aberdeen	0		0	0	0	0	1	0	0	0	
Nebraska:											
Omaha	17		0	0	4	18	0	1	0	1	47
Kansas:											
Topeka	1		0	3	2	7	0	1	0	1	16
Wichita	0		0	0	1	5	0	2	0	0	24
Delaware:											
Wilmington	0		0	1	2	5	0	0	0	5	27
Maryland:											
Baltimore	2		1	2	14	26	0	12	2	25	189
Cumberland	0		0	0	1	2	0	0	0	0	9
Frederick	0		0	0	0	1	0	0	0	0	4
District of Columbia:											
Washington	2	1	0	0	9	17	0	6	1	4	158
Virginia:											
Lynchburg	4		0	0	0	0	0	1	0	2	10
Richmond	1		0	0	2	8	0	3	0	6	38
Roanoke	3		0	0	1	2	0	0	5	0	11
West Virginia:											
Charleston	2		0	0	3	0	0	0	2	5	13
Huntington	3		0	3	0	6	0	0	0	0	
Wheeling	1		0	18	3	1	0	2	0	3	22
North Carolina:											
Raleigh	1		0	1	2	5	0	0	0	0	17
Wilmington	5		0	0	1	7	0	1	1	0	14
Winston-Salem	2		0	0	3	2	0	1	0	0	10

City reports for week ended October 29, 1932—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Carolina:											
Charleston	0	4	0	0	4	0	0	2	1	0	15
Columbia	5	-------	0	0	3	1	0	1	0	1	29
Greenville	0	-------	0	0	0	0	0	0	0	0	0
Georgia:											
Atlanta	14	1	1	0	4	9	0	3	0	5	85
Brunswick	0	-------	0	0	1	1	0	0	0	0	5
Savannah	6	-------	0	0	2	1	0	1	6	0	40
Florida:											
Miami	0	-------	0	0	2	0	0	2	0	0	20
Tampa	3	1	1	0	0	1	0	1	0	0	19
Kentucky:											
Covington	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Lexington	1	1	0	1	1	3	0	0	2	0	14
Louisville	6	6	0	0	11	6	0	1	0	0	80
Tennessee:											
Memphis	18	-------	1	0	5	5	0	8	4	1	87
Nashville	2	-------	3	0	4	5	0	1	0	0	64
Alabama:											
Birmingham	13	2	0	0	3	9	0	1	0	0	54
Mobile	3	-------	0	0	3	0	0	1	0	0	17
Montgomery	4	-------	-------	0	-------	2	0	-------	0	2	-------
Arkansas:											
Fort Smith	0	-------	-------	0	-------	1	0	-------	3	0	-------
Little Rock	1	-------	0	2	3	1	0	0	0	0	5
Louisiana:											
New Orleans	13	1	1	1	19	5	0	5	2	1	128
Shreveport	1	-------	0	0	0	2	0	2	0	0	31
Oklahoma:											
Muskogee	0	-------	0	0	0	1	0	0	0	0	-------
Tulsa	5	-------	0	0	0	5	0	0	1	0	-------
Texas:											
Dallas	45	2	1	0	3	8	0	4	1	0	58
Fort Worth	11	-------	0	0	4	8	0	1	0	0	27
Galveston	1	-------	0	0	2	0	0	0	0	0	16
Houston	14	-------	0	0	5	3	0	6	0	0	59
San Antonio	3	1	1	0	4	2	0	6	0	0	47
Montana:											
Billings	0	-------	0	0	0	0	0	0	1	0	7
Great Falls	0	-------	0	7	1	0	0	0	1	0	8
Helena	0	-------	0	0	0	0	0	0	0	0	7
Missoula	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Idaho:											
Boise	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Colorado:											
Denver	1	-------	2	1	9	14	0	6	0	2	84
Pueblo	0	-------	0	1	0	2	0	1	0	5	7
New Mexico:											
Albuquerque	1	-------	1	0	2	2	0	6	1	0	23
Arizona:											
Phoenix	0	-------	0	0	0	2	0	2	0	0	-------
Utah:											
Salt Lake City	0	-------	0	0	3	0	0	0	1	0	31
Nevada:											
Reno	0	-------	0	0	1	0	0	0	0	0	2
Washington:											
Seattle	0	-------	-------	0	-------	4	2	-------	0	5	-------
Spokane	0	-------	-------	0	-------	2	0	-------	1	1	-------
Tacoma	0	-------	0	0	1	6	0	2	0	0	27
Oregon:											
Portland	0	2	0	1	4	2	2	0	0	0	58
Salem	0	1	0	0	0	0	0	0	0	0	-------
California:											
Los Angeles	20	102	3	18	14	34	0	28	2	34	276
Sacramento	1	2	2	1	0	1	0	2	0	3	21
San Francisco	0	5	0	0	7	7	0	12	1	31	169

City reports for week ended October 29, 1932—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
New York:			
New York	5	5	3
Pennsylvania:			
Philadelphia	0	0	10
Scranton	1	0	0
Ohio:			
Cincinnati	0	1	0
Indiana:			
Indianapolis	4	0	0
Illinois:			
Chicago	5	3	2
Michigan:			
Grand Rapids	0	0	1
Wisconsin:			
Milwaukee	1	1	0
Superior	0	0	1
Minnesota:			
Minneapolis	1	1	0
Iowa:			
Des Moines	2	0	0
Missouri:			
St. Louis	1	0	0
Maryland:			
Baltimore	2	0	0
District of Columbia:			
Washington	0	0	1
Louisiana:			
New Orleans	2	1	0
Texas:			
Fort Worth	0	0	1
Colorado:			
Denver	1	0	1
California:			
San Francisco	1	0	0

Lethargic encephalitis.—Cases: New York, 1; Detroit, 1; New Orleans, 1.

Pellagra.—Cases: Philadelphia, 1; Scranton, 1; Charleston, S. C., 1; Atlanta, 1; Memphis, 1; New Orleans, 2.

Typhus fever.—Cases: Charleston, S. C., 1; Savannah, 2.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended October 22, 1932.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended October 22, 1932, as follows:

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis			2	1					3
Chicken pox			27	198	59	26	19	19	348
Diphtheria	2		30	12	6	21			71
Erysipelas			5	1			1	1	8
Influenza	2			3				13	18
Measles	1	5	79	257	13	4	94	43	496
Mumps				36	3			6	45
Paratyphoid fever				4					4
Pneumonia	1			15				4	20
Poliomyelitis		2	36	10					48
Scarlet fever	5	7	63	55	17	30	3	21	201
Smallpox				1	1				2
Trachoma				1				14	15
Tuberculosis		3	71	20	7	24	1	16	142
Typhoid fever		7	46	21	2	4	1		81
Undulant fever				1					1
Whooping cough			87	69	9	3	6	9	183

YUGOSLAVIA

Communicable diseases—September, 1932.—During the month of September, 1932, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	164	24	Poliomyelitis	64	5
Cerebrospinal meningitis	7	6	Rabies	3	3
Diphtheria and croup	890	109	Scarlet fever	370	21
Dysentery	773	95	Sepsis	14	7
Erysipelas	167	5	Tetanus	48	23
Measles	135		Typhoid fever	1,049	85
Paratyphoid fever	90	5			

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

(NOTE.—A table giving current information of the world prevalence of the quarantinable diseases appeared in the Public Health Reports for October 28, 1932, pp. 2123-2136. A similar cumulative table will appear in the Public Health Reports to be issued November 25, 1932, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Cholera

Philippine Islands.—During the week ended November 5, 1932,30 cases of cholera with 22 deaths were reported in Samar Province, P. I.

Plague

Dutch East Indies.—During the week ended September 17, 1932, a case of plague was reported from Surabaya, Dutch East Indies. It was said not to be in the port.

Peru.—During September, 1932, two cases of plague with two deaths were reported in Lima Department, Peru.

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