Public Health Reports

Vol. 62 • MARCH 28, 1947 • *No. 13*

Printed With the Approval of the Bureau of the Budget as Required by Rule 42 of the Joint Committee on Printing

THE USE OF DDT TO CONTROL MURINE TYPHUS FEVER IN SAN ANTONIO, TEXAS [1]

By DAVID E. DAVIS, *Senior Assistant Sanitarian (R), United States Public Health Service* [2]

INTRODUCTION

This paper describes the results of an experimental program in San Antonio designed to reduce the number of cases of typhus fever by controlling the fleas on rats. Previous experiments (*1*) have shown that the application of DDT (dichlorodiphenyltrichloroethane) to rat runs, burrows, and harborages reduces the number of fleas found upon the rats. The aim of those experiments was to find a method for controlling murine typhus fever by reducing the rat-flea population. Of several insecticides tested, DDT was found to be the most suitable for this purpose. After the demonstration that the fleas on rats can be controlled, it remained to determine if the number of cases of typhus fever can be diminished by dusting DDT in buildings of cities or towns.

TYPHUS FEVER IN SAN ANTONIO

San Antonio was selected as a suitable city for this experiment because a comparatively large number of cases had occurred there in recent years. A total of 32 cases was recorded in 1943 and 91 cases were reported to the health department in 1944. Furthermore, trapping of rats had been conducted in various parts of the city and thus the distribution of typhus in rats was known in some detail. The spatial distribution of cases of human typhus and the occurrence of typhus in rats are discussed elsewhere (*2*).

[1] From the Medical Division, Typhus Control Unit, Communicable Disease Center, Atlanta, Ga.
[2] Now located at the Johns Hopkins School of Hygiene and Public Health, Baltimore, Md.

The City of San Antonio has a population of about 450,000 at the present time, although the 1940 census gives a total of 315,000. The recent increase is due to the influx of war workers and to the annexation of several suburbs. The city has a good downtown business district containing several tall modern buildings. The northern part of town is an extensive, good residential area of small homes. The eastern section of the city also is residential, and contains the Negro section and some slum areas. The southern and western parts of San Antonio may be classified as fairly prosperous residential areas. Adjacent to the business district on the southwest side is an area inhabited largely by poor persons where sanitary and housing conditions are very inadequate. However, three slum-clearance projects have cleaned up a certain amount of this district. On the northern borders of this district are the produce markets and a slum business district containing warehouses and small grocery and poultry stores. The grain mills are located in two sections of the city. One group is found along the railroad tracks in the slum district and the other group of mills is placed along the Southern Pacific tracks east of the main business area. There are many small shopping centers scattered throughout the residential areas consisting usually of one or two drug stores, three or four grocery stores and several other small shops.

Two control measures have been in effect for some time. The first is a United States Public Health Service typhus-control program, consisting of rat proofing and eradication of rats in the business district. This work had eliminated the rats from about eight blocks in the downtown shopping sections, which contain many tall buildings. Results indicate that this program has definitely prevented the recurrence of typhus cases such as originated in this area in 1944. It is certain that this rat proofing did not interfere with the interpretation of the experimental dusting of another section of San Antonio.

Another control measure is the poisoning of rats by the Fish and Wildlife Service in cooperation with the junior chamber of commerce and the health department. This poisoning has been carried out since 1941 throughout the whole city and was designed primarily to reduce the economic damage caused by rats and, therefore, was done almost exclusively at stores and mills. In addition to distributing poison to business houses, the Fish and Wildlife Service also uses red squill rat poison in a nine-block area around the supposed source of typhus. This procedure has also been carried out since 1941. After the beginning of the dusting program, all poisoning was stopped in the experimental dusted area, but poisoning was continued in the undusted area. Because such poisoning in previous years had failed to halt the increase of the number of typhus cases, it was felt that the continuance of poisoning in the undusted area would have little effect on

the experiment and that it was desirable to continue the poisoning operations in order to maintain the cooperation and good will of the agencies concerned. In addition to this professional work, many residents buy poison or traps and kill some rats, but such efforts are so local and sporadic that the abundance of rats is reduced only temporarily.

PROCEDURE AND ORGANIZATION OF DUSTING

The area selected for experimental dusting consisted of the south-western one-third of the city (maps 1 and 2). This section was chosen because in previous years the number of typhus cases in this district was higher than in any other compact area of the city. The slum area (north-east part) was dusted with DDT first, then the southern section, and then the western section. The area was primarily residential but had some small shopping centers and many corner grocery stores. About 10 percent of the premises dusted were commercial. The rats were found inside the houses, in stores, and in garages. Chicken coops were common in this district and frequently harbored many rats.

It will be noted from the maps that the commercial district within the experimental area was not dusted. This district forms a T, extending east-west along Commerce Street and north-south along the railroad tracks. This commercial area was omitted because it would have required so much time and it would have been difficult to trace the source of typhus cases in this district.

The rest of the city was not dusted, and the eastern part served as a control. Fortunately, it was possible to select a boundary line by using the river, several parks and the commercial district, so that the two areas were clearly separated except on the northern side. The dusted and undusted areas were not strictly comparable because of the presence of the slum area in the experimental section. One small section of the undusted area, located just east of the northern part of the dusted area, was similar to the slum district. This small section was densely populated and had poor housing and sanitary conditions. However, the other parts of the two areas were comparable and no better division of the city was possible. The populations of the two areas were not known but seemed to be about equal.

Because the northern section was not comparable to the dusted area, it has been excluded from the final conclusions, but it is discussed fully in this report for the sake of completeness.

The experiment is considered to have begun on May 21, 1944, when investigations of murine typhus fever in the city were started. The dusting began April 4, 1945, and ended August 31, 1945. Investigations of the cases continued until October 15, 1945. The

experiment was ended then because the maximum typhus season was over, and the DDT, as indicated by flea indices, was no longer effective in killing fleas. Furthermore, DDT became available to the general public and hence there was no longer a "control" area, because DDT was being used extensively.

In order to eliminate the fleas on rats, it was necessary to spread DDT thoroughly in all rat runs, burrows, and harborages. A mixture of 10 percent DDT and 90 percent pyrrophyllite was used throughout the work. The dust could be dispersed with any insecticide pump. Pumps which had a cylinder containing 2 to 5 pounds of material were best because this size obviated frequent refilling. In addition, a small screw-topped bottle with holes punctured in the cover was necessary for use on overhead runs and for putting dust in small holes. A flashlight was also required. The inspectors put dust in every place where the rats occur. Cats and dogs were also routinely dusted. At the beginning, it was difficult to obtain good men and teach them the habits of rats so that no runs were overlooked.

The dusting program in San Antonio was combined with an inspection for *Aedes aegypti* mosquitoes and a general sanitation survey. In order to facilitate the work of the inspectors, a preliminary visit was made to the houses by volunteers organized by various welfare agencies, called the Baby Diarrhea Council. These volunteers were primarily interested in education aimed at the prevention of infant diarrhea and, in addition, explained to the householder that an inspector would follow in a few weeks. These preliminary visits assisted the workers greatly in many areas. Although the inspector was also concerned with mosquito eradication and general sanitation, this report describes only the work related to the reduction of fleas and its effect on typhus fever.

Each inspector carried a clip board with sheets containing entries for the various items and went from house to house, covering all blocks systematically. The inspector noted down on his tally sheet whether the premise had no rats or a light or heavy infestation of rats and also the number of rooms dusted. This last figure was a rough approximation; a garage, an attic, a chicken coop, etc., were each considered as one room. If the house was closed or if the householder was uncooperative, the address was noted and a special man returned to these houses on another day to put out the DDT, if possible. Sometimes two or three return visits were necessary to find someone at home. Since it was found that on rainy days the householders objected to having dirt tracked into the house, the crew inspected and dusted stores and business establishments in the shopping centers and in the slum business district during bad weather. Fortunately, there were few rainy days. The area treated with DDT was primarily

residential, but all corner groceries and other stores in all shopping centers were inspected. Large factories and mills were omitted. About 2,500 local stores were inspected and dusted.

The operating cost of the dusting program was analyzed by Vinton W. Bacon, Assistant Sanitary Engineer (R) of the United States Public Health Service. It will be remembered that the DDT program was part of an *aegypti* mosquito-control and sanitation survey. Therefore, the operating costs of the DDT portion were estimated from the total costs. The figures presented in table 1 cover the period

TABLE 1.—*Operation and costs of San Antonio DDT-dusting program (Apr. 4–July 31, 1945)*

Item	Number or amount	Item	Cost
Premises inspected, residential and business	22,028	Program operating costs:	
Rooms dusted with 10-percent DDT	23,099	Supervision	$855.00
DDT used (pounds)	6,145	Secretarial	224.00
Per premises	.28	Labor	3,294.00
Per room	.27	Auto	336.00
Premises worked per man-day	48	DDT	799.00
Rooms worked per man-day	50	All operating items	5,508.00
		Operating cost per premise	.25
		Operating cost per room	.24

from April 4 to July 31, 1945. Approximately 5,000 more premises, covered in the month of August, are not included because, due to vacations and changes in personnel, the costs are not representative.

These costs do not include allowance for "before and after" trapping and counting of fleas as a check on the thoroughness of dusting. Although this method was used for experimental purposes in San Antonio, it is believed that it is far more economical and faster to have the foreman check the work by close supervision.

To summarize the operating expenses, it can be said that the program cost an average of 25 cents for each place and that 3 tons of 10-percent DDT was used for 22,000 premises, mostly residential.

FLEA INDICES BEFORE AND AFTER DUSTING

In order to check the efficiency of the work of the crew, rats were collected before and after dusting. It must be emphasized that the flea indices from these rats are a measure of the efficiency of the crew; they are not a measure of the efficiency of DDT. From our experience, we have become satisfied that when DDT is thoroughly and carefully put out, the number of fleas can be reduced almost to zero. The flea indices recorded here include rats trapped in premises which were dusted by inexperienced men, rats trapped at several establishments which were not dusted, due to misunderstandings, and rats trapped in premises which were dusted by men who were subsequently dismissed for incompetence.

Both roof rats (*Rattus rattus*) and brown rats (*Rattus norvegicus*) were present in the area. The roof rats tended to frequent houses and stores. The brown rats were most common in chicken coops and in grocery stores with wooden floors. The total numbers were about equal in the area, but the distribution was very irregular. The rats were collected alive in steel traps and combed for ectoparasites. The traps were set in houses or stores about a week before dusting and then about a week after dusting. The rats did not necessarily come from the same premises before and after dusting, but did come from the same area. Thus, in any one month the flea indices before and after dusting with DDT were calculated on the basis of rats caught within a small area.

Table 2 shows the monthly flea indices for rats trapped before and

TABLE 2.—*Flea indices before and after dusting with DDT*

Species, time, and place	April 1945			May 1945			June 1945		
	Number of rats combed	Number of fleas per rat	Percentage of rats infested	Number of rats combed	Number of fleas per rat	Percentage of rats infested	Number of rats combed	Number of fleas per rat	Percentage of rats infested
BEFORE DDT									
Rattus rattus	67	3.1	79	44	2.1	61	32	3.6	78
Residences	38	2.5	79	26	2.8	61	22	3.0	86
Stores	29	3.9	79	18	1.1	61	10	5.0	60
Rattus norvegicus	41	8.5	85	28	10.8	78	33	18.3	91
Residences	34	9.7	85	21	8.6	76	15	18.8	100
Stores	7	2.7	86	7	17.5	86	18	17.8	83
AFTER DDT									
Rattus rattus	9	2.8	66	38	2.3	37	70	1.5	43
Residences	6	2.2	50	33	1.1	39	50	1.7	40
Stores	3	------	------	5	10.0	20	20	.8	50
Rattus norvegicus	5	8.6	100	11	9.1	91	36	3.2	69
Residences	4	------	------	11	9.1	91	29	3.5	69
Stores	1	------	------	0	0	0	7	2.3	71

BEFORE DDT	July 1945			August 1945			September 1945		
Rattus rattus	9	1.4	66	37	11.0	43			
Residences	4	------	------	6	.7	50			
Stores	5	7.0	80	31	13.0	42			
Rattus norvegicus	42	3.6	64	43	12.0	84	No rats trapped before DDT		
Residences	14	5.6	79	25	10.2	76			
Stores	28	2.6	57	18	14.8	95			
AFTER DDT									
Rattus rattus	88	.8	22				42	.3	21
Residences	66	.8	21	No rats trapped after DDT			19	.2	21
Stores	22	.8	23				23	.4	22
Rattus norvegicus	35	2.2	51				173	4.0	75
Residences	26	2.3	42				80	3.7	70
Stores	9	2.1	78				93	4.2	80

after dusting. Adult and young rats are grouped together because there was no consistent difference in the flea indices for these two age classes. Rats caught in stores were separated from rats caught in residences because the ecological conditions differed. "Fleas per rat"

refers to the number of fleas divided by the number of rats combed. "Percentage infested" refers to the number of rats with fleas divided by the number of rats combed. Both indices are recorded as recommended by Rumreich and Wynn (*3*). These monthly indices are not consolidated into one figure for all months because it is desirable to indicate the seasonal variation in the abundance of fleas. The indices for September (after DDT) are based on rats caught in an area which had been dusted 4 months previously.

The fleas belonged to the species *Xenopsylla cheopis* primarily, but included some *Leptosylla segnis* in April, May and June. In some cases, individuals of *Ctenocephalides felis* (cat flea), *Echidnophaga gallinacea* (chicken flea), and *Nosopsyllus faciatus* were present, but are not included in the table because of their rarity. This table shows that during the first month of the work there was only a small reduction in the number of fleas found on rats. This poor result was due to the inexperience of the crew and to the difficulty in finding suitable men for the work. The drop in flea counts for June showed considerable improvement. In July, the number of fleas was decreasing due to normal seasonal changes, and hence the drop in abundance after dusting was not very noticeable. Because of this normal decrease, trapping after dusting was abandoned in August. In September, rats came from an area dusted in June, and the fleas on brown rats were as abundant as would be expected at that season. The fleas on roof rats were less common than would be expected at that season. It should be noted that the "after DDT" indices are about the same as the normal indices in the winter season.

PRESENCE OF COMPLEMENT-FIXING ANTIBODIES IN RATS

In order to measure the results of dusting DDT for the control of typhus in rats, a large number of rats was collected from the slum area in the months of May and June and again in September. The aim of this survey was to determine whether the reduction in the number of fleas resulted in a decrease in the prevalence of typhus in rats. Table 3 shows the percentages of complement-fixing antibodies in rats found in the slum area in May to June 1945 and in the same region in September 1945. Rats were collected in both residences and stores, but are grouped in the calculation of the "percentage positive" because no consistent difference in the presence of antibodies was apparent. For comparison, the table shows data from undusted grain mills for a similar period.

The adult brown rats showed a slight drop in the percentage of rats positive for antibodies between June and September. It should be remembered that many of the rats caught in September were a year or more old and could have become infected many months previously.

TABLE 3

Percentages of rats having antibodies before and after DDT

Species	Before DDT (May to June)		After DDT (September)	
	Number of rats bled	Percentage positive	Number of rats bled	Percentage positive
Rattus rattus:				
Adults	45	47	8	50
Young	42	12	22	0
Rattus norvegicus:				
Adults	43	70	65	52
Young	29	31	76	5

Presence of antibodies in rats caught in undusted grain mills

Species	March to April		September	
	Number of rats bled	Percentage positive	Number of rats bled	Percentage positive
Rattus rattus:				
Adults	7	57	10	20
Young	7	14	9	33
Rattus norvegicus:				
Adults	45	62	19	67
Young	11	54	17	29

On the other hand, the young rats in which antibodies were found indicate the presence of typhus within recent months, and it will be noted that there was a considerable decrease in the prevalence of antibodies in young rats in the 3 months after dusting.

The rats caught in grain mills were intended to serve as a control to indicate any seasonal changes which may have occurred in the prevalence of antibodies, but unfortunately it was impossible to obtain significant numbers of rats. However, it should be noted that the prevalence of antibodies in young rats was high for September in the undusted grain mills. Studies in other parts of the city gave no indication of a seasonal variation of antibodies in rats, but it would be expected that in September, after the maximum abundance of fleas, there would be an increase in prevalence of antibodies. The change 3 months after dusting, however, was in the direction of a decrease in prevalence, especially in young rats.

OCCURRENCE OF TYPHUS CASES 1944–45

From the beginning of this experiment on May 21, 1944, only those cases confirmed by laboratory tests have been considered. After May 21 in 1944, 12 cases without laboratory confirmation were reported, mostly in June. Seven cases reported to the health department in 1945 have been omitted because of the lack of laboratory tetts.

In May 1944, an effort was made to improve the reporting of cases by having interviews with physicians and by cooperation with the local medical society. In July 1945, a physician specializing in the epidemiology of typhus was assigned to the health department. He made a special effort to confirm all reported cases by laboratory tests and succeeded in checking the diagnosis of nearly every case reported in the city. Reporting was again stimulated by interviews with individual physicians and the cooperation of the Bexar County Medical Society and the local hospitals. The cooperation of these physicians and the medical society is greatly appreciated.

After a case had been reported to the health department, an epidemiological investigation was made to determine the origin. Information was obtained by the epidemiologist from the patient or members of the family about the place of work, stores visited, and trips out of town. Then an investigation for rats was made at the indicated buildings. Wherever possible, rats were trapped and their blood tested for complement-fixing antibodies. From these data, the probable source of infection was determined.

Frequently, it was clear that infection was acquired at home or at work. In other instances, it could be determined that the patient had become infected within a limited area near the residence, if not at the residence. Such cases were listed as of unknown origin. For several cases, no source could be determined because the patient traveled about the city or lived out of town. A typical case of unknown origin was a mayonnaise salesman who lived in a house free of rats and pets and who visited innumerable restaurants. Another type of undetermined origin was that of a woman who had a cat but no rats at home, bought groceries in a heavily infested store nearby, and ate regularly in a heavily infested cafe. In interpreting the maps, it should be noted that a circle represents the residence of a case of unknown origin. However, the residence was probably not the source because an inspection did not reveal any evidence of rats or pets. In many of these instances, it was nevertheless clear that the person had become infected in the neighborhood.

An analysis of the typhus cases from May 21, 1944 to October 12, 1945 is presented in table 4. The cases are grouped according to the date of onset into 4-week periods in order to show the seasonal changes in incidence. The cases are listed according to the probable source of infection. In the table, the experimental area (see maps) refers to the southwestern part of San Antonio, most of which was dusted from April to August, 1945. "Untreated area" refers to the rest of the city. The column "control" refers to the area used for comparison with the treated area. The column "northern" refers to cases contracted in the northern part of the city which is not considered a part of the experi-

TABLE 4.—*Probable source of typhus cases (1944–45) according to date of onset of disease*

Date of onset of disease	Number of cases in experimental area		Number of cases in untreated area			Number of cases of unknown source	Grand total
	Before DDT	After DDT	Control	Northern	Business		
1944							
May 21–June 17	0		0	0	0	0	0
June 18–July 15	0		0	0	0	3	3
July 16–Aug. 12	3		2	0	2	6	13
Aug. 13–Sept. 9	4		4	0	2	5	15
Sept. 10–Oct. 7	1		3	0	2	8	14
Oct. 8–Nov. 4	3		3	0	4	5	15
Nov. 5–Dec. 2	3		3	0	1	2	9
Dec. 3–Dec. 31	3		2	0	0	2	7
1945							
Jan. 1–28	1		2	0	1	4	8
Jan. 29–Feb. 26	2		2	0	0	2	6
Feb. 27–Mar. 27	0		1	0	0	0	1
Mar. 28–Apr. 24	[1] 0	[2] 0	0	0	0	3	3
Apr. 25–May 23	2	0	1	1	0	1	5
May 24–June 20	1	0	2	2	4	1	10
June 21–July 19	1	3	4	0	0	2	10
July 20–Aug. 16	3	0	5	3	0	7	18
Aug. 17–Sept. 14	2	0	7	1	0	5	15
Sept. 15–Oct. 12	1	1	4	1	2	0	9

[1] The cases in this column after Apr. 4, 1945, occurred in parts of the experimental area which had not yet been treated with DDT.
[2] Dusting begun Apr. 4, 1945.

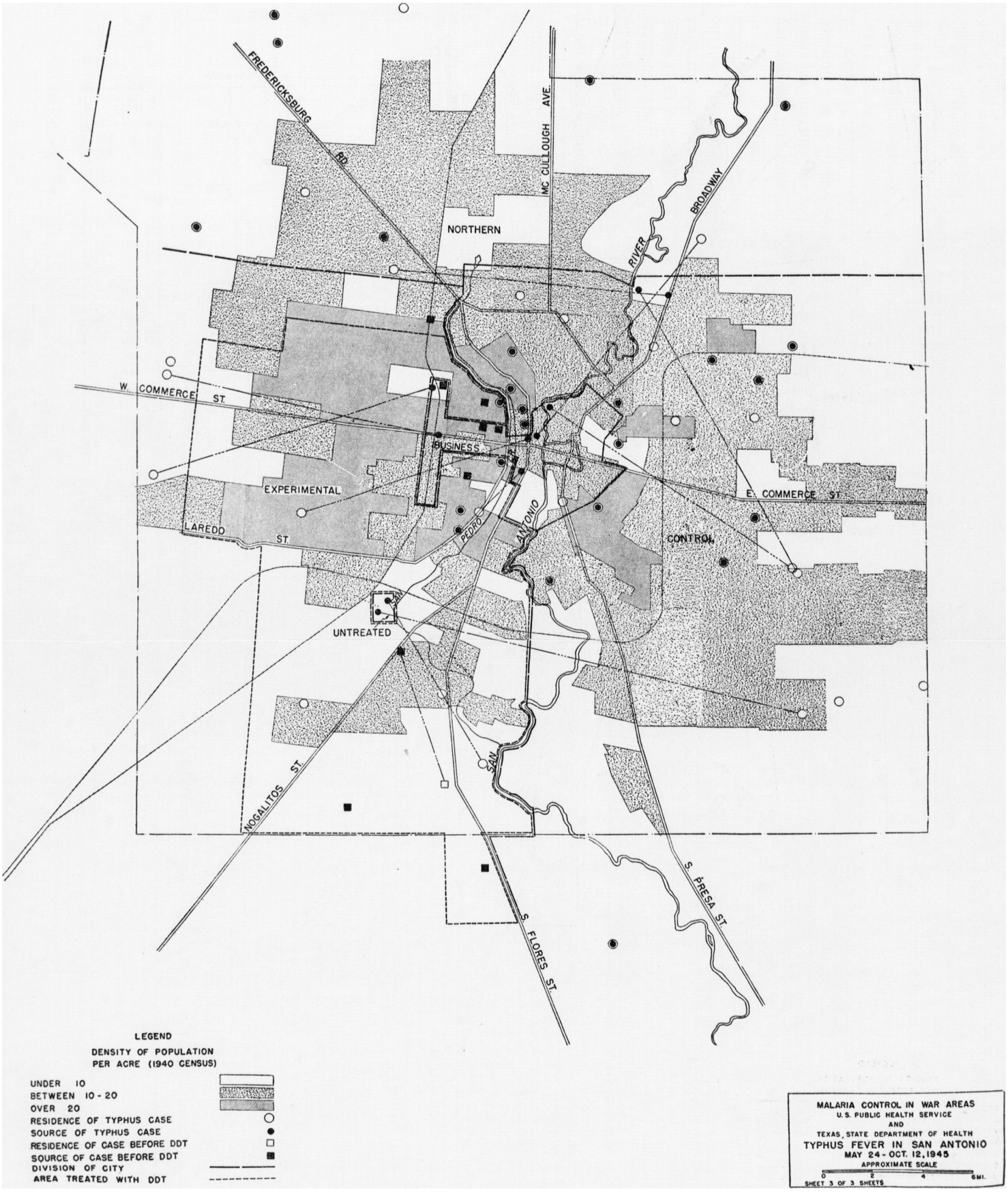
ment. The column "business" includes cases apparently contracted in the downtown business area and in the stock yards. The column "unknown source" includes cases of unknown origin.

The maps show the various areas of the city and indicate the density of population by degrees of shading. The area actually dusted is indicated by the wide border line. (Note the T-shaped commercial district and the stock yards which were excluded.) A spot indicates the source of infection. A circle indicates the residence of a case. Hence a spot within a circle indicates that infection was acquired at home. A spot tied to a circle indicates the residence and also the source of infection. A circle without a spot indicates the residence of a case of unknown origin.

Maps 1 and 2 show the areas used for the experiment and the density of population by shading. The experimental area and the control areas were selected as being as similar as possible in regard to the number of cases in 1944 and the number of inhabitants. Map 1 shows all confirmed cases occurring between May 21, 1944, and May 24, 1945. This map thus includes one season of typhus fever before the dusting began. Map 2 shows by circles the cases occurring after dusting in the experimental area and after May 24, 1945 in the untreated area. The squares in map 2 indicate cases which occurred in the experimental area after the program started but before the crew got to the particular spot. May 24 was chosen as the initial date because few cases occurred before this date in 1945. This map, thus, contrasts

MAP 1

(Face p. 458)



MAP 2

(Back map 1)

the treated and the untreated areas. Because of the impossibility of dusting the whole experimental area at one moment, it has been very difficult to show the occurrence of cases clearly. These maps attempt to show the distribution of typhus cases before dusting (map 1) and after dusting one part of the city (map 2).

CASES IN THE EXPERIMENTAL AREA

From May 21, 1944, up to the beginning of dusting, 20 proven cases of typhus are known to have been contracted in the area, which was subsequently dusted in 1945. Dusting began on April 4, 1945, and progressed throughout the area. Since the whole area could not be dusted at once, cases occurred after dusting began but before the crew got to that particular place. Ten such cases were recorded (table 4). In addition, 4 cases of unknown actual source were contracted somewhere in the area which was subsequently dusted. The most densely populated and the worst typhus area was dusted first and was covered before the typhus season really began. The less critical parts were treated in July and August.

From table 4, it will be noted that only four cases occurred after DDT was applied. One of these cases occurred 19 weeks after the house was dusted, a period which allows ample time for the fleas to return to normal abundance. Two cases occurred in houses which were not dusted due to negligence on the part of the inspector.

Another method of examining the data is to consider the progression of dusting throughout the area in relation to the cases occurring during the work (table 5). These cases are indicated in map 2 as squares.

TABLE 5.—*Progression of dusting in area covered*

Date	Area dusted		Area not yet dusted	
	Number of premises [1]	Number of cases [1]	Number of premises [1]	Number of cases [1]
April 4	0	0	26,832	0
April 28	1,856	0	24,976	1
May 26	6,309	0	20,523	3
June 30	11,488	1	15,344	5
July 28	19,486	3	7,346	5
August 31	26,832	3	0	8

[1] Cumulative totals.

(Note that the crew never got to the area in which two cases occurred.) From the table, it is seen that eight cases occurred in the ever-decreasing area not yet covered, whereas three cases occurred in the ever-increasing area covered. It should be noted (see "grand total," table 4) that few cases occurred in the city before June, and that the worst typhus sections were covered before June.

Three cases occurred in undusted blocks on the border of the experimental area before the crew arrived. They are located on map 2 on the northern edge of the commercial district. All of these cases were housewives who lived in a poorhouse heavily infested with rats and fleas. Another case occurred in a block on the southern edge of town which was omitted at first because it contained only three houses.

Two persons lived in the experimental area but probably became infected elsewhere. One case lived in a house which was well dusted and had rats without fleas. He worked in a heavily infested cafe in the undusted business district. Another man lived in a house in the dusted area and worked in a rat-infested dance hall in the undusted district. His house had no rats or pets. It is possible that he became infected in the dance hall where his work consisted of sweeping up each morning.

Two cases of unknown origin lived in the experimental area. One case was a young girl who lived in a good residential district. There were no rats on the premises, and the garage had been thoroughly dusted because of the presence of mice. The girl had a dog but had used DDT to eliminate fleas the day she got the dog. She frequently visited a friend in another part of town who had a cat, and she complained of getting fleas there. The origin of this infection is obviously difficult to determine. The other case was a boy who worked all over town.

No case which was diagnosed clinically as typhus but which lacked confirmatory laboratory tests originated in the dusted area.

CASES IN THE UNTREATED AREA

Table 4 shows that 23 cases occurred in the control area at the time the experimental area was being treated. The persons became infected in their homes or chicken yards or in the stores in the undusted area. It will be noted that in 1944 the cases in the experimental area were about equal in number to the cases in the control area.

It is of additional interest to note that seven cases occurred in the small undusted slum area just east of the northern part of the treated area. These few blocks resemble the dusted slum area of about 60 blocks which in previous years has always produced many cases but which in 1945, after dusting, produced only 4 cases.

The cases of unknown origin which lived in the untreated area were five housewives who surely became infected near home, four salesmen who worked all over town, and four men who worked outside of the dusted area. Thus, none of these unknowns worked regularly in the dusted area.

DISCUSSION

The occurrence of human typhus cases in the dusted area shows emphatically the necessity for dusting every part of every house which contains rats. In actual practice, it was found best to instruct the inspectors to dust every place which could have had rats at that time or which might have had rats in the past. However, the more thoroughly trained inspectors were able to put the dust in the proper places and not scatter it widespread. Nevertheless, since dust is cheap and labor is expensive, in general practice it will be found best to put out a lot of dust and expect that most of it will get into the right places.

The collection of rats before and after dusting was of surprisingly little value as a check upon the work of the inspectors. In an experimental study of this type, it did have value by again showing that DDT will control flea population and by giving evidence that the number of fleas was reduced in the experimental area. However, for programs in other cities, the chief value of trapping rats before and after dusting is to check on the work of the inspectors. But such policing can be done much more cheaply by the foreman of the crew. He should spend part of each day going back over the work done in previous days, to inquire of the householder whether the inspector was present, and to look carefully to see that the inspector put out DDT in all places. Such policing is absolutely necessary to the success of dusting programs.

The problems of transportation, policing, and dusting are facilitated if each inspector is assigned an area of several blocks (perhaps 10 to 15) and then works there until it is completely dusted.

The encouraging results of this experiment in San Antonio suggest that DDT may be an additional method for controlling typhus fever. However, dusting must be repeated at intervals and would be very expensive in some towns and especially in rural areas. The fundamental rat eradication procedures of general sanitation, ratproof construction, and rat poisoning must be continued in order to eliminate rats. DDT should be considered as an auxiliary method applicable to areas which cannot be economically ratproofed or to outbreaks of typhus which must be speedily controlled.

DDT should be used before poisoning to reduce the number of fleas, and ratproofing and complete eradication of rats should follow. In areas where ratproofing is impracticable, or for emergencies, DDT should be dusted first and then poison put out about a week later. This "one-two" treatment is especially suitable for residential areas.

Much additional work needs to be done to evaluate definitively the place of DDT in the control of murine typhus. This preliminary

experiment lacked adequate epidemiological studies before the DDT was applied. Thorough evaluation studies in other cities, in villages, and in rural areas in other parts of the United States will be required to confirm the encouraging results of this experiment. Such unknown factors as the possibility of transmission by mites, by inhalation, and by fleas from domestic pets must be examined.

It is of interest to note that the control of typhus fever by reducing the arthropod vector is similar to the methods of controlling other insect-borne diseases. In some diseases, it may be easier and cheaper to reduce the insect vector than the vertebrate reservoir.

ACKNOWLEDGMENTS

A program of this type naturally requires the collaboration of many men and agencies. Dr. C. R. Eskey, formerly Medical Officer in Charge of the Typhus Control Unit of the United States Public Health Service, originally suggested this approach to typhus control. Dr. Lewis C. Robbins, Director of the San Antonio Health Department, appreciated the experimental nature of the program and wisely integrated it with other health activities. Major Warren H. Booker, sanitary engineer of the health department, supervised the general aspects of the work. Dr. E. R. Rickard of the Rockefeller Foundation, by his careful epidemiological studies, filled a big gap in the program. The program benefited from the advice of the Typhus Advisory Committee, with Col. Charles F. Craig as chairman, which held monthly meetings to follow the progress.

Special appreciation is due to Mr. Gordon Dexter, area supervisor of malaria control, and to his foreman, Mr. Price, for conscientious administration of the 10-man crew of inspectors. The success of the program depended upon their careful work. Mr. Robert H. Salley painstakingly bled and combed the rats used in this study.

SUMMARY

To determine the value of reducing rat fleas for the control of typhus fever, an experiment was conducted in San Antonio. The southwestern part of the city was dusted with DDT and the rest of the city was untreated.

A crew of 10 men in house to house inspections placed 10-percent DDT in every place rats frequented. A total of 26,832 premises were inspected between April 4 and August 31, 1945. Forty-eight premises were worked per man-day, with an average of ¼ pound of DDT and an operational cost of 25 cents per each of the premises.

Rats were trapped and combed before and after the application of DDT. At first, due to the inexperience of the dusting crew, the

drop in flea index was small, but in June and July reductions in flea abundance occurred. The blood from rats caught in the same area in May (before DDT) and in September (after DDT) was tested for complement-fixing antibodies; the prevalence of antibodies in young rats decreased.

The sources of typhus cases reported to the San Antonio Health Department were investigated. The diagnosis and reporting of cases was improved by interviews with physicians and, after July 1945, by the presence of an epidemiologist.

In the experimental area, 20 cases occurred between May 21, 1944, and April 4, 1945, when dusting began. After the program started, 4 cases occurred in treated premises and 10 cases occurred in premises not yet treated.

In the untreated area, 22 cases occurred between May 21, 1944, and May 24, 1945. After that time, 23 cases were traced to the untreated area. Seven of these cases originated in a small untreated slum area similar to the large slum experimental area. In addition, eight cases originated in the northern part of the city.

The reduction of rat fleas by careful and thorough distribution of DDT is an additional method for the control of typhus fever and has given encouraging results in San Antonio. Additional evaluation will determine the extent of its usefulness.

REFFRENCES

(*1*) Davis, David E.: The control of rat fleas (*Xenopsylla cheopis*) by DDT. Pub. Health Rep., **60:** 485–489 (1945).
(*2*) Davis, David E., and Pollard, Morris: The distribution of murine typhus in rats and in humans in San Antonio. Am. J. Trop. Med., **26:** 619–624 (1946.)
(*3*) Rumreich, A. S., and Wynn, R. S.: A study of the rodent-ectoparasite population of Jacksonville, Fla., Pub. Health Rep., **60:** 885–905 (1945).

PLAGUE—THE SURVIVAL OF THE INFECTION IN FLEAS OR HIBERNATING GROUND SQUIRRELS

By F. M. PRINCE, *Associate Entomologist,* and N. E. WAYSON, *Medical Director, Plague Investigation Station, United States Public Health Service, San Francisco, California*

Plague recurs from year to year in the same locality among rodents which hibernate for several months of the year. However, the process through which the disease is continued during the periods of hibernation has been a subject of hypothesis and conjecture rather than of controlled observation.

Wu Lien-teh (*1*) states that he is convinced that the tarabagan, a Siberian marmot, harbors the infection in a latent phase during the

winter hibernation of the animal, and that an active phase of the disease occurs with the awakening of the animal in the spring.

It is known that the plague micro-organism can survive in fleas for a period of several weeks, and it has been assumed that the recurrence of the disease in a locality is caused by infected fleas which have lived in the burrows of their rodent hosts throughout the period of hibernation.

An attempt has been made to test these suppositions by an experiment in which natural conditions were approximated under laboratory control.

Six ground squirrels (*Citellus richardsonii*) and six hundred fleas (*Diamanus montanus*) were used. The squirrels were trapped alive in areas of Montana and North Dakota in which plague has not been found by repeated surveys. They were shipped to the laboratory in San Francisco, and each was held in a separate clean glass box for about 2 months before the experiment was begun. The fleas were bred in the laboratory in clean surroundings on a normal meadow mouse (*Microtus*). During the last week of October, each squirrel had become quiescent and was placed in a separate large tin container with 100 fleas and a bedding of sheets of white tissue paper. The containers were covered with gauze of fine mesh and capped with a perforated metal top. These conditions constituted a nest in which the fleas and their droppings could be easily found, and in which the animal was held captive and could be observed. Evidence of the awakening of the animal was present, since animals shredded the paper and the gauze when they awoke from their hibernating sleep. The nest was placed in a refrigerator where the temperature was maintained at 40° F. throughout the experiment, a period of 4 months.

All the squirrels were in a good hibernating sleep within 10 days. When in this condition, they could be lifted from the nest and handled without being awakened, and all were examined after an interval of 2 weeks and again after 2 months to determine their condition.

The squirrels were grouped in three lots of two each, A, B, and C.

Lot A: Two normal squirrels and 100 plague-infected fleas on each squirrel.
Lot B: Two hibernating squirrels, each inoculated with 0.1 cc. of a plague culture suspended in broth, with 100 normal fleas on each squirrel.
Lot C: Two normal squirrels with 100 normal fleas on each squirrel. A control lot.

Lot A.—The 100 fleas placed with each of these squirrels had been infected with plague by feeding on white mice whose tail blood contained 10 to 20 *Pasteurella pestis* per microscopic field of a blood smear and which died with plague within 3 hours after exposure to the fleas. The fleas selected for the test were those in whose droppings the micro-organism was demonstrated by culture on blood plates.

Inspection of these squirrels after the initial 2-week interval showed

that they were in hibernating sleep, and there was no evidence of activity during this period. However, after the 2-month interval, there was evidence that they had awakened, although they were asleep at the time of this second inspection.

At the end of the 4-month period, the squirrels were awake. They were removed from the nest and both they and their nests were carefully searched for fleas. Fourteen fleas in all were found alive, and many flea droppings were found on the paper nests. The squirrels were kept in clean glass boxes for 15 days to see whether they would develop plague. Each flea was kept in a clean test tube at room temperature and each was given several opportunities to feed on a white mouse during a period of 10 days. However, three fleas failed to feed, and eight died within the 10 days. The droppings of each flea were collected during this period and were cultured on blood agar. As the fleas died, they were triturated in saline, and each was injected subcutaneously into a white mouse.

One flea which had failed to feed before its death (on the third day after removal from the nest) produced droppings containing *P. pestis*, and a suspension of the flea introduced into a white mouse produced acute plague.

No other fleas produced findings of infection either by biting mice, in their droppings, or by being injected into mice.

The squirrels remained well and exhibited no pathology at necropsy.

Lot B.—The two hibernating squirrels of this lot were each inoculated with 0.1 cc. of a broth suspension of *P. pestis* which killed three white mice and three guinea pigs when given subcutaneously at the same time in 0.1-cc. dosage. The fleas placed on these squirrels were normal.

Upon inspection 2 weeks later, one of the squirrels was dead of acute plague. Five fleas recovered from this squirrel at this time produced plague in a guinea pig when triturated and injected subcutaneously.

The other squirrel in this lot was asleep, and there was no evidence of activity during this period. This squirrel was examined again after a 2-month interval and was still in hibernation, but showed evidence of activity sometime during this interval. At the end of the 4-month period, this squirrel was awake. It was removed from the container and both the animal and nest were carefully searched for fleas. Twenty-three fleas were found alive and many flea droppings were found on the paper bedding. The squirrel, and the fleas from the squirrel and its nest, were collected, maintained and treated in the same manner as the squirrels and fleas of Lot A. A few of the fleas failed to feed, and about half of the number died within 10 days after removal from the nest and segregation in test tubes.

None of the fleas produced infection by biting white mice, or when

they were injected into white mice, and their droppings did not contain *P. pestis*.

When the squirrel was killed, a slight infiltration and pigmentation of the skin was observed at the site of inoculation but no other pathology was noted.

Lot C.—The normal squirrels and normal fleas of this lot served as a control to determine whether they would survive under the conditions of the experiment.

When the two squirrels were observed after the 2-week interval, both were asleep. One, however, had shredded the tissue paper, an indication of some activity during this period.

After a 2-month interval, both squirrels showed signs of previous activity, but were in a hibernating sleep at the time of examination.

At the end of the 4-month period when the squirrels were removed from their nest, one was in hibernation and one was awake. A careful search of the squirrels and of their nests was made, and 100 fleas were recovered alive. Immediately after the nests were removed from the refrigerator, these fleas began copulation. They were placed with a normal squirrel in a clean glass box at room temperature and 5 or 6 weeks later a new crop of fleas had developed.

DISCUSSION

It is evident from these experiments that a flea will remain alive and infected with plague in a virulent form for a period of 4 months in the nest of a hibernating squirrel. Also, a large percentage of both normal and infected fleas die within this period. Most of the fleas which were infected and remained alive did not retain the infection for the entire 4 months.

The death, or complete recovery, of the squirrels which were inoculated with plague after their hibernation had become well developed, does not afford a criterion for the opinion that the infection is carried through hibernation in a latent phase and becomes active upon the awakening of the animal. Normal fleas became infected when placed with the squirrel which later died of plague after inoculation with 0.1 cc. of a broth suspension of *P. pestis*. This fact, and the number of flea droppings in each of the six nests, suggest that the fleas fed either during the hibernation of the squirrel or during its periods of transitory activity. However, a large number of all the fleas died during the entire period, and a much larger number died among those which were originally infected or which were probably infected from the squirrel which later died of plague than among those which were not infected. An explanation of the greater mortality among the infected fleas may be that they were unable to feed after having become blocked by the growth of the micro-organism within them.

The process by which plague is carried over the hibernating period of rodents has not been established by this experiment, but enough suggestive evidence has been obtained to merit its repetition, and this is now in progress.

SUMMARY

Six hibernating ground squirrels were stored for 4 months at 40° F. in separate nests.

Two squirrels were inoculated with plague, and each seeded with 100 normal fleas. One squirrel died of plague, and one recovered. Twenty-three fleas of this lot were recovered alive at the end of 4 months and contained no plague germs.

Two squirrels were each seeded with 100 infected fleas. One of the fourteen live fleas recovered from them retained *P. pestis* in a virulent form and produced plague when injected into a white mouse. The squirrels did not become infected.

Two squirrels were seeded with 100 normal fleas each. Fifty per-cent of the fleas were recovered and were able to reproduce.

REFERENCE

(*1*) Wu Lien-teh; J. W. H. Chun; R. Pollitzer; and C. Y. Wu: Plague. A Manual for Medical and Public Health Workers. National Quarantine Service, 1936, Shanghai, China.

GUIDE TO HEALTH ORGANIZATION IN THE UNITED STATES

A REVIEW

Many persons, including students and new entrants into public health work throughout the United States and visitors from abroad, find considerable difficulty when tracing particular health services to individuals through the complex social and political fabric of our democratic society. The relationships and interrelationships of the numerous agencies of Federal, State, and local government, of voluntary health organizations, and of private professional groups in the field of health are often puzzling, to say the least. In an effort to make the intricacies of health organization in this country understandable both to technically informed health workers and to the general public, the United States Public Health Service has recently published a simple, concise guide on the subject. This Guide to Health Organization in the United States [1] is a useful reference as source material; being in pamphlet form, it is suitable for popular distribution.

[1] Guide to Health Organization in the United States. By Joseph W. Mountin and Evelyn Flook. Miscellaneous Publication No. 35, United States Public Health Service, Washington, Government Printing Office (1946). Price 20 cents.

Following a foreword by Dr. Thomas Parran, Surgeon General of the United States Public Health Service, the authors preview graphically the subject matter treated more fully in the text. They liken the total organizational structure for improvement of health in the United States to a building of several floors, each floor representing one level of government.

Agencies of each governmental level—Federal, State, and local—officially responsible for any type of health activity are identified, and their outstanding health functions and methods of administration are briefly discussed. Contributions to the total health organization by voluntary health agencies and institutions and by private physicians, dentists, and nurses are also described. Although functions of Federal, State, and local official and voluntary agencies are treated in separate sections, the cooperative arrangements between the several governmental areas are emphasized. Operation of direct services by local health agencies, with assistance in the form of financial aid, loan of personnel, performance of technical services, advice, or supervision by State and Federal agencies, is featured.

Although an exhaustive analysis of the complete pattern of health organization is not the purpose of the guide, sufficient detail is presented throughout to show that at the Federal, State, and local plane there is one main health authority, with a surprisingly large number of other agencies charged with one or more contributory or independent health activities. For the most part, direct Federal health service is restricted to selected groups of beneficiaries. Services designed for the community as a whole are usually channelled to the recipient through State and local governmental agencies. State health services, on the other hand, encompass regulatory functions, advice, supervision, promotional activities, financial aid, and in some instances even direct service. Primary responsibility for safeguarding community health rests with the local authority. To simplify discussion, health functions are classified as public health and preventive services, medical and custodial care, professional licensure, and professional education.

The wide diversity in local health service organization for the most part reflects the general diversity in local government. Since local governmental units differ markedly in their financial resources as well as in their legal authority to provide public service, they differ also in the kind of health organization that can be maintained. Regional differences in the development of organized local health service and in the content of local health programs are illustrated in the material presented.

The entire body of information is summarized in terms of health services received by a typical family, either directly or indirectly, through designated agencies of local, State, or Federal government, as well as from voluntary agencies or private professional personnel. The value of this pamphlet is enhanced by the inclusion of significant tabular material in the text and appendices and by an extensive bibliography, provided for those whose interest or purpose leads them beyond the basic facts to which the publication is purposely restricted.

YELLOW FEVER QUARANTINE REQUIREMENTS IN TANGANYIKA TERRITORY

The Department of State has forwarded to the United States Public Health Service a copy of an amendment to the Yellow Fever Ordinance, 1942, of the Tanganyika Territory, Africa. Pertinent portions of this amendment are presented below for the guidance of persons preparing to travel to Tanganyika Territory and of physicians consulted by such persons.

1. This Ordinance may be cited as the Yellow Fever (Amendment) Ordinance, 1946.

2. Section 2 of the Yellow Fever Ordinance, 1942 (in this Ordinance referred to as the principal Ordinance), is hereby amended by substituting for the definition of "unimmunized person" which occurs therein the following definition:—"unimmunized person" means a suspected person who is unable to satisfy the authority that—

(a) he is immune from yellow fever by reason of a previous attack of the disease; or

(b) he was vaccinated more than ten days (or other prescribed period) and less than four years (or other prescribed period) before he last left an endemic or infected area; or

(c) he was re-vaccinated less than four years (or other prescribed period) before he last left an endemic or infected area and within four years (or other prescribed period) of his previous vaccination.

3. Sub-section (1) of section 4 of the principal Ordinance is hereby repealed and the following sub-section is substituted therefor:—

(1) Every person who enters the Territory within a period of six days (or other prescribed period) from the date when he last left an endemic area shall report in person to the nearest authority without delay.

4. Section 5 of the principal Ordinance is hereby repealed and the following section is substituted therefor:—

5.—(1) Every unimmunized person within an infected area shall, if the authority so requires, submit himself to medical observation or medical surveillance.

(2) Every unimmunized person may be kept under medical observation or medical surveillance until a period of six days (or other prescribed period) has elapsed since the date when he last left an endemic or infected area:

Provided that where such person was vaccinated less than ten days (or other prescribed period) before he last left any such area he may be kept under such observation or surveillance for a period not exceeding ten days (or other prescribed period) from the date of such vaccination.

EXAMINATION FOR POSITIONS AS FOOD AND DRUG INSPECTOR

The Civil Service Commission has announced an examination for filling Food and Drug Inspector positions at salaries ranging from $2,644 to $4,149 a year. Complete instructions on how to apply for the examinations are given in the examination announcement. Information and application forms may be obtained from most first- and second-class post offices, from Civil Service regional offices, or from the U. S. Civil Service Commission, Washington 25, D. C. Applications must be filed with the appropriate district office not later than April 8, 1947.

DEATHS DURING WEEK ENDED MAR. 1, 1947

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Mar. 1, 1947	Corresponding week, 1946
Data for 93 large cities of the United States:		
Total deaths	10,165	10,390
Median for 3 prior years	9,866	
Total deaths, first 9 weeks of year	89,943	94,394
Deaths under 1 year of age	796	626
Median for 3 prior years	626	
Deaths under 1 year of age, first 9 weeks of year	7,377	5,480
Data from industrial insurance companies:		
Policies in force	67,327,235	67,181,267
Number of death claims	14,003	15,894
Death claims per 1,000 policies in force, annual rate	10.8	12.3
Death claims per 1,000 policies, first 9 weeks of year, annual rate	9.8	11.3

INCIDENCE 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

REPORTS FROM STATES FOR WEEK ENDED MARCH 8, 1947

Summary

Sharp increases in the incidence of influenza were reported for the week in certain States of the North Central and West South Central areas and in West Virginia and Colorado. A total of 21,991 cases was reported, as compared with 7,974 last week and a 5-year (1942–46) median of 4,744. Of the net increase of 14,017 over last week's figures, nearly 8,000 occurred in Texas. Of the current total, 21,144 cases, or 96 percent, occurred in the 13 States reporting more than 125 cases, as follows (last week's figures in parentheses): Indiana 526 (137), Iowa 205 (0), Missouri 239 (90), Kansas 3,395 (325), Virginia 520 (491), West Virginia 304 (52), South Carolina 504 (628), Georgia 650 (454), Alabama 233 (130), Arkansas 952 (376), Oklahoma 272 (62), Texas 11,624 (3,636), and Colorado 1,720 (1,212). Only 2 other States reported more than 86 cases—Montana 120 (last week 20) and Idaho 125 (last week 10). The total for the year to date is 62,582 (more than one-third of which were reported for the current week), as compared with 165,882 for the corresponding week last year and a 5-year median of 49,557.

Of 40 cases of poliomyelitis reported for the current week, 10 occurred in California. The total to date is 592, as compared with 443 for the same period in 1946 and a 5-year (1942–46) median of 276. Of 9 cases of smallpox for the week, 5 occurred in Kansas. The reported incidence of undulant fever to date is above that for the same period last year—1,007 cases as compared with 639. To date 25,028 cases of whooping cough have been reported, more than for the same period of any other year since 1943, and nearly twice as many cases of tularemia have been reported (417) as for the same period last year (213).

A total of 10,206 deaths was reported for the current week in 93 large cities in the United States, as compared with 10,165 last week, 9,885 for the corresponding week last year, and a 3-year (1944–46) median of 9,583. To date, 100,149 deaths have been reported in these cities, as compared with 104,279 for the same period last year. This recent increase in urban mortality has accompanied increased incidence of respiratory conditions. Also the number of infant deaths in these cities is above last year's figure, no doubt reflecting the recent high birth rates.

Telegraphic morbidity reports from State health officers for the week ended Mar. 8, 1947, and comparison with corresponding week of 1946 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946	
NEW ENGLAND												
Maine	3	1	0	-	11	-	223	23	23	0	0	2
New Hampshire	0	0	0	1	-	-	11	-	5	0	0	0
Vermont	0	0	0	25	-	-	267	4	15	0	0	1
Massachusetts	14	5	5	-	-	-	489	484	536	1	4	7
Rhode Island	0	0	0	-	1	17	232	9	38	0	1	1
Connecticut	1	1	0	1	9	3	883	143	307	1	0	4
MIDDLE ATLANTIC												
New York	9	23	19	[1] 3	[1] 2	[1] 9	314	3,677	1,941	7	17	29
New Jersey	3	1	2	7	10	9	342	1,660	1,417	0	6	10
Pennsylvania	11	21	10	4	4	3	572	2,833	1,323	5	16	26
EAST NORTH CENTRAL												
Ohio	13	20	10	5	8	12	927	349	349	3	16	16
Indiana	15	14	5	526	54	12	65	728	222	0	2	7
Illinois	5	18	14	12	9	9	49	1,939	887	6	14	16
Michigan [2]	5	11	5	5	2	6	108	3,383	630	0	4	12
Wisconsin	0	0	1	44	81	44	65	826	826	3	3	3
WEST NORTH CENTRAL												
Minnesota	10	7	5	-	3	1	57	41	45	0	2	2
Iowa	2	4	4	205	-	1	27	47	244	2	0	0
Missouri	2	6	4	239	6	6	7	442	442	1	9	9
North Dakota	3	2	1	2	8	8	1	-	102	1	1	0
South Dakota	2	1	4	-	-	-	15	82	82	0	0	0
Nebraska	0	2	2	82	17	4	10	85	153	2	1	1
Kansas	5	1	5	3,395	4	6	14	912	460	0	0	2
SOUTH ATLANTIC												
Delaware	0	3	0	-	-	-	4	38	22	0	0	0
Maryland [2]	3	17	6	5	8	8	43	320	320	2	3	4
District of Columbia	1	0	0	2	2	2	18	152	72	0	2	2
Virginia	4	7	7	520	467	637	370	531	531	5	3	10
West Virginia	2	5	4	304	16	18	103	94	94	0	3	5
North Carolina	16	11	8	-	-	14	259	323	323	0	6	6
South Carolina	4	7	6	504	830	705	68	463	225	1	3	3
Georgia	2	7	6	650	67	67	262	459	320	0	3	3
Florida	11	3	1	32	11	10	12	89	89	2	2	3
EAST SOUTH CENTRAL												
Kentucky	5	9	4	4	88	20	4	739	95	0	9	9
Tennessee	10	4	7	70	47	123	112	246	246	0	3	11
Alabama	7	5	6	233	244	229	61	175	132	2	1	6
Mississippi [2]	6	12	9	-	-	-	-	-	-	2	6	6
WEST SOUTH CENTRAL												
Arkansas	2	1	6	952	128	128	176	128	128	2	6	4
Louisiana	9	5	4	18	152	27	59	286	206	0	6	6
Oklahoma	8	3	3	272	99	99	3	113	102	3	1	3
Texas	19	48	48	11,624	2,830	1,689	251	1,541	1,541	10	19	19
MOUNTAIN												
Montana	0	1	0	120	28	14	212	23	80	0	0	1
Idaho	0	1	1	125	40	2	5	36	85	0	0	0
Wyoming	1	0	0	33	1	14	24	35	35	0	0	0
Colorado	5	4	6	1,720	35	40	77	331	331	0	0	0
New Mexico	0	1	1	5	1	2	55	10	13	0	0	0
Arizona	1	4	0	86	122	123	33	70	70	0	1	1
Utah [2]	0	0	0	34	5	29	8	545	178	0	2	1
Nevada	0	0	0	-	-	-	3	1	9	0	0	0
PACIFIC												
Washington	9	8	3	77	-	4	35	881	253	4	3	6
Oregon	1	3	3	24	18	18	18	296	97	0	1	3
California	19	18	19	21	64	86	203	2,848	1,598	7	23	23
Total	248	325	265	21,991	5,532	4,744	7,156	28,440	21,511	72	202	284
10 weeks	2,972	3,898	3,160	62,582	165,882	49,557	48,981	122,429	136,091	834	2,047	2,548
Seasonal low week [3]	(27th) July 5–11			(30th) July 26–Aug. 1			(35th) Aug. 30–Sept. 5			(37th) Sept. 13–19		
Total since low	10,538	15,542	12,023	95,557	528,130	85,419	71,868	148,553	174,456	1,806	3,551	5,000

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Dates between which the approximate low week ends. The specific date will vary from year to year.

Telegraphic morbidity reports from State health officers for the week ended Mar. 8, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and para typhoid fever [4]		
	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946		Mar. 8, 1947	Mar. 9, 1946	
NEW ENGLAND												
Maine	0	0	0	33	51	39	0	0	0	0	0	0
New Hampshire	0	0	0	3	3	9	0	0	0	0	0	0
Vermont	0	1	0	6	13	12	0	0	0	0	0	0
Massachusetts	0	2	1	119	219	381	0	0	0	3	3	1
Rhode Island	0	0	0	12	9	18	0	0	0	0	0	0
Connecticut	0	1	0	45	43	81	0	0	0	0	0	1
MIDDLE ATLANTIC												
New York	4	0	1	371	594	581	0	0	0	0	4	4
New Jersey	0	0	0	134	121	171	0	0	0	1	2	0
Pennsylvania	1	1	1	224	468	637	0	0	0	1	8	7
EAST NORTH CENTRAL												
Ohio	0	1	2	447	490	442	0	1	0	0	0	2
Indiana	0	2	0	160	129	129	0	1	1	4	0	1
Illinois	1	1	1	179	265	289	1	0	0	3	1	1
Michigan [2]	0	0	0	122	197	276	0	0	0	1	1	1
Wisconsin	2	0	0	95	173	319	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	79	58	110	0	0	0	0	2	0
Iowa	0	0	0	77	57	67	0	0	0	0	0	1
Missouri	0	0	0	29	75	113	1	0	0	1	1	1
North Dakota	0	0	0	8	11	26	0	0	0	0	0	0
South Dakota	0	0	0	15	17	22	0	0	0	0	0	0
Nebraska	0	0	0	25	39	40	0	0	0	0	1	0
Kansas	1	1	1	76	90	101	5	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	12	11	12	0	0	0	1	0	0
Maryland [2]	0	0	0	39	129	129	0	0	0	0	0	0
District of Columbia	0	0	0	9	36	36	0	0	0	0	1	0
Virginia	0	0	0	38	77	77	0	0	0	1	2	1
West Virginia	0	1	0	6	33	48	0	0	0	0	0	0
North Carolina	2	0	0	46	50	43	0	0	0	2	0	0
South Carolina	0	0	0	5	9	9	0	0	0	2	6	1
Georgia	0	0	0	17	16	22	1	0	0	2	3	2
Florida	2	3	0	11	7	7	0	0	0	1	2	2
EAST SOUTH CENTRAL												
Kentucky	1	0	0	56	59	59	0	0	0	3	0	0
Tennessee	0	1	1	55	28	53	0	0	0	0	1	1
Alabama	3	0	0	12	16	16	0	0	0	1	0	1
Mississippi [2]	1	1	0	9	8	15	0	0	0	1	3	2
WEST SOUTH CENTRAL												
Arkansas	2	0	0	6	2	10	1	1	1	0	1	1
Louisiana	4	2	1	4	10	10	0	0	0	1	3	3
Oklahoma	1	1	0	6	24	24	0	0	0	2	0	1
Texas	3	7	4	60	99	76	0	3	1	6	2	2
MOUNTAIN												
Montana	0	2	0	5	9	14	0	0	0	1	0	0
Idaho	0	0	0	9	8	8	0	0	0	0	0	0
Wyoming	0	0	0	13	33	33	0	0	0	0	1	0
Colorado	0	0	0	64	49	49	0	0	0	0	1	1
New Mexico	1	0	0	5	3	9	0	0	0	0	0	0
Arizona	0	0	0	3	18	18	0	0	0	0	0	0
Utah [2]	1	0	0	13	27	64	0	0	0	0	0	0
Nevada	0	0	0	7	0	2	0	0	0	0	0	0
PACIFIC												
Washington	0	1	1	60	38	39	0	0	0	0	0	0
Oregon	0	0	1	34	37	30	0	0	0	0	1	2
California	10	8	3	145	213	213	0	3	0	6	6	1
Total	40	37	29	3,008	4,171	5,036	9	9	12	44	56	53
10 weeks	[5] 592	443	276	26,745	32,501	39,658	40	72	136	[5] 437	423	568
Seasonal low week [3]	(11th) Mar. 15–21			(32nd) Aug. 9–15			(35th) Aug. 30–Sept. 5			(11th) Mar. 15–21		
Total since low	[5] 25,367	13,780	12,342	53,431	71,072	78,754	94	148	253	3,965	4,674	5,707

[2] Period ended earlier than Saturday.

[3] Dates between which the approximate low week ends. The specific date will vary from year to year.

[4] Including paratyphoid fever reported separately, as follows: Massachusetts 3 (salmonella infection); Georgia 2; Kentucky 1; Texas 2; California 2.

[5] Corrected reports: Poliomyelitis, Arkansas, week ended February 22, 2 cases (instead of 1); typhoid fever, North Carolina, week ended February 8, 1 case (instead of 2).

Telegraphic morbidity reports from State health officers for the week ended Mar. 8, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Whooping cough			Week ended Mar. 8, 1947							
	Week ended—		Median 1942–46	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Mar. 8, 1947	Mar. 9, 1946		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	16	12	28								3
New Hampshire	2		1								
Vermont	19	14	34								2
Massachusetts	117	146	146		1						2
Rhode Island	12	46	39								
Connecticut	48	69	67				1				4
MIDDLE ATLANTIC											
New York	196	220	261	5	1		1				2
New Jersey	130	154	154	2							1
Pennsylvania	180	123	141								3
EAST NORTH CENTRAL											
Ohio	162	104	125	1							1
Indiana	42	19	19				2		1		1
Illinois	90	104	104	3	1				3		9
Michigan [2]	232	123	147	1							3
Wisconsin	143	75	75	2							7
WEST NORTH CENTRAL											
Minnesota	12	9	20	2							1
Iowa	26	10	10								16
Missouri	24	6	14			1			2		2
North Dakota			3								
South Dakota			1								
Nebraska	41		8								
Kansas	5	73	49								2
SOUTH ATLANTIC											
Delaware	10	3	2								
Maryland [2]	65	23	41								
District of Columbia	2	4	4								
Virginia	63	35	70			231					1
West Virginia	27	31	31								
North Carolina	93	55	100		1						
South Carolina	27	69	69		3					1	
Georgia	12	7	16	1	4				6	11	1
Florida	54	15	18	1		1				4	1
EAST SOUTH CENTRAL											
Kentucky	39	25	32								
Tennessee	27	36	36	1					4	3	
Alabama	50	11	22						1	1	
Mississippi [2]									2	3	2
WEST SOUTH CENTRAL											
Arkansas	26	6	20	1	2	6			3	2	
Louisiana	4	10	5	13	1		1		1	2	
Oklahoma	5	5	9					3	3		1
Texas	376	219	219	8	215	115			1	10	14
MOUNTAIN											
Montana	8		5								
Idaho	4	12	4								
Wyoming	4	4	4								
Colorado	18	26	26	1							1
New Mexico	9	18	17								
Arizona	25	21	21			14					
Utah [2]	11	26	27	1							3
Nevada	5		1								
PACIFIC											
Washington	39	37	35	1		7					
Oregon	2	9	30								1
California	133	97	277	4	4					1	2
Total	2,635	2,111	2,614	48	233	375	5	3	27	38	86
Same week, 1946	2,111			37	297	81	19	1	24	40	66
Median, 1942–46	2,614			33	287	71	11	0	10	32	[6] 80
10 weeks: 1947	25,028			449	3,461	2,219	67	9	417	460	1,007
1946	18,272			400	2,920	1,099	85	4	213	500	639
Median, 1942–46	23,430			261	2,118	648	85	4	208	500	[6] 747

[2] Period ended earlier than Saturday.

[6] 2-year average, 1945–46.

Leprosy: Kentucky 1 case.

WEEKLY REPORTS FROM CITIES [1]

City reports for week ended Mar. 1, 1947

This table lists the reports from 90 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	1	0	------	0	0	0	2	0	0	9
New Hampshire:												
Concord	0	0	------	0	------	0	2	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	24	0	0	0	0	0	0	1
Massachusetts:												
Boston	9	0	------	0	41	2	12	0	27	0	0	22
Fall River	0	0	------	0	8	0	1	0	4	0	0	4
Springfield	1	0	------	0	2	0	0	0	3	0	0	2
Worcester	0	0	------	0	------	0	5	0	7	0	0	15
Rhode Island:												
Providence	0	1	------	0	131	0	4	0	7	0	0	11
Connecticut:												
Bridgeport	0	0	------	0	21	0	0	0	4	0	0	------
Hartford	0	0	------	0	22	0	2	1	2	0	1	1
New Haven	0	0	------	0	31	0	3	0	13	0	0	13
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	1	------	1	4	0	8	0	0	5
New York	12	1	7	2	132	4	72	0	139	0	0	41
Rochester	0	0	------	0	3	1	1	0	21	0	0	3
Syracuse	0	0	------	0	------	0	2	0	11	0	0	14
New Jersey:												
Camden	7	0	------	0	------	0	2	0	1	0	0	2
Newark	0	0	1	0	4	1	3	0	9	0	0	29
Trenton	0	0	1	0	26	1	3	0	11	0	1	------
Pennsylvania:												
Philadelphia	1	0	4	1	19	1	17	0	42	0	0	32
Pittsburgh	1	0	------	0	98	2	10	0	21	0	0	10
Reading	1	0	------	0	6	0	0	0	7	0	3	2
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	1	2	------	0	5	0	6	0	0	8
Cleveland	3	0	1	2	387	3	9	0	40	0	0	17
Columbus	2	0	------	0	1	0	3	0	11	0	0	5
Indiana:												
Fort Wayne	0	0	------	0	13	0	4	0	3	0	0	------
Indianapolis	1	1	------	1	4	0	8	0	15	0	0	34
South Bend	0	0	------	0	3	0	0	0	6	0	0	------
Terre Haute	0	0	------	0	------	0	1	0	5	0	0	------
Illinois:												
Chicago	0	0	1	0	24	4	31	1	55	0	0	40
Springfield	1	0	------	0	1	0	5	0	4	0	0	------
Michigan:												
Detroit	3	2	------	0	2	4	21	0	72	0	1	109
Flint	0	0	------	0	------	0	3	0	3	0	0	9
Grand Rapids	0	0	------	0	3	0	2	0	4	0	0	6
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	0	0	0	------
Milwaukee	0	0	------	0	10	1	9	0	8	0	0	52
Racine	0	0	------	0	------	0	1	0	1	0	0	4
Superior	0	0	------	0	------	0	1	0	4	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	1	0	2	0	4	0	0	3
Minneapolis	5	0	------	0	3	0	7	0	9	0	0	6
St. Paul	1	0	------	0	2	2	3	0	19	0	0	9
Missouri:												
Kansas City	0	0	------	0	6	2	9	1	15	0	0	14
St. Joseph	0	0	------	0	------	0	0	0	0	0	0	1
St. Louis	0	0	48	1	1	0	16	0	11	0	0	9

[1] In some instances the figures include nonresident cases.

City reports for week ended Mar. 1, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	------	0	1	0	2	0	0	------
Kansas:												
Topeka	0	0	------	0	1	0	0	0	4	0	0	------
Wichita	0	0	------	0	1	0	4	0	4	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	1	0	2	0	3	0	0	4
Maryland:												
Baltimore	6	0	1	1	6	0	10	0	9	0	0	40
Cumberland	0	0	------	0	------	0	2	0	0	0	0	------
Frederick	0	0	------	0	------	0	0	0	1	0	0	------
District of Columbia:												
Washington	0	0	2	0	9	1	9	0	13	0	0	2
Virginia:												
Lynchburg	0	0	------	0	------	0	0	0	0	0	0	1
Richmond	0	0	1	1	82	0	3	0	1	0	0	------
Roanoke	0	0	------	0	1	0	0	0	6	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	------	0	1	0	3	0	0	1
North Carolina:												
Raleigh	0	0	------	0	1	0	1	0	0	0	0	8
Wilmington	2	0	------	0	12	0	0	0	0	0	0	------
Winston-Salem	0	0	------	0	36	0	0	0	0	0	0	------
South Carolina:												
Charleston	0	0	15	0	1	0	1	0	0	0	0	------
Georgia:												
Atlanta	0	0	91	1	4	0	6	0	2	0	1	0
Brunswick	0	0	------	0	------	0	0	0	0	0	0	2
Savannah	0	0	3	0	53	0	0	0	0	0	0	------
Florida:												
Tampa	1	0	4	0	2	1	2	0	5	0	0	6
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	4	3	------	0	5	0	5	0	0	7
Nashville	0	0	------	2	------	0	2	0	5	0	0	------
Alabama:												
Birmingham	1	0	8	2	4	1	5	0	0	0	0	------
Mobile	0	0	3	0	5	0	2	0	1	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	1	------	0	1	0	0	0	0	------
Louisiana:												
New Orleans	7	0	12	2	23	4	7	4	3	0	4	7
Shreveport	0	0	------	0	------	0	8	0	0	0	0	------
Oklahoma:												
Oklahoma City	0	0	7	0	------	1	4	0	1	0	1	------
Texas:												
Dallas	0	0	------	0	13	0	6	0	1	0	0	5
Galveston	0	0	------	0	------	0	1	0	0	0	0	------
Houston	1	0	------	0	------	0	8	0	2	0	0	5
San Antonio	1	0	------	2	7	0	6	0	5	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	0	0	0	1
Great Falls	0	0	------	0	133	0	1	0	1	0	0	------
Helena	0	0	------	0	5	0	0	0	2	0	0	1
Missoula	0	0	------	0	1	0	1	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	3	0	0	0	0	------
Colorado:												
Denver	2	0	34	0	22	0	17	0	27	0	0	1
Pueblo	0	0	------	0	------	0	0	0	1	0	0	------
Utah:												
Salt Lake City	1	0	------	0	5	0	1	0	3	0	0	1

City reports for week ended Mar. 1, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	0	1	2	2	0	6	0	0	4
Spokane	0	0	2	1	11	0	3	0	3	0	0	------
Tacoma	1	0	------	0	1	0	0	0	1	0	0	6
California:												
Los Angeles	8	0	2	0	4	1	3	4	27	0	0	7
Sacramento	0	0	------	0	------	1	1	0	2	0	0	1
San Francisco	2	0	------	0	9	3	5	1	10	0	13	3
Total	83	5	254	26	1,483	44	417	12	793	0	25	659
Corresponding week, 1946*	75	------	149	32	10,167	------	430	------	1,120	2	9	525
Average 1942-46*	71	------	200	[2] 40	[3] 5,164	------	[2] 470	------	1,658	1	10	710

[2] 3-year average, 1944-46.
[3] 5-year median, 1942-46.
*Exclusive of Oklahoma City.

Dysentery, amebic.—Cases: New York 1; Chicago 2; Detroit 1; San Francisco 1.
Dysentery, bacillary.—Cases: Worcester 1; Detroit 1.
Dysentery, unspecified.—Cases: San Antonio 1.
Tularemia.—Cases: New Orleans 1.
Typhus fever, endemic.—Cases: Nashville 2; New Orleans 3; Houston 1; Los Angeles 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 90 cities in the preceding table (latest available estimated population, 34,602,700)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	26.1	2.6	2.6	0.0	732	5.2	75.8	2.6	180	0.0	2.6	204
Middle Atlantic	10.2	0.5	6.0	1.9	133	5.1	52.8	0.0	125	0.0	1.9	64
East North Central	6.1	1.8	1.8	3.0	272	7.3	62.6	0.6	144	0.0	0.6	174
West North Central	14.1	0.0	96.5	2.0	30	8.0	84.5	2.0	137	0.0	0.0	88
South Atlantic	14.7	0.0	191.2	4.9	340	3.3	60.5	0.0	70	0.0	1.6	105
East South Central	11.8	0.0	88.5	41.3	53	5.9	82.6	0.0	65	0.0	0.0	41
West South Central	22.9	0.0	48.3	12.7	109	12.7	104.1	10.2	30	0.0	12.7	43
Mountain	23.8	0.0	270.0	0.0	1,318	0.0	182.7	0.0	270	0.0	0.0	32
Pacific	17.4	0.0	6.3	1.6	41	11.1	22.1	7.9	77	0.0	20.6	33
Total	12.5	0.8	38.4	3.9	224	6.6	63.0	1.8	120	0.0	3.8	100

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 15,1947.—During the week ended February 15, 1947, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		21		222	291	18	29	135	124	840
Diphtheria		3	1	24	2	3		4		37
Dysentery, amebic					6					6
German measles				16	42	1		3	8	70
Influenza		23			12	2				37
Measles		112		147	55	306	119	334	409	1,482
Meningitis, meningococcus			2	1					1	4
Mumps		11		34	493	73	284	30	148	1,073
Poliomyelitis		1		6						7
Scarlet fever		5	4	48	87	3	3	3	12	165
Tuberculosis (all forms)		3	7	105	22	7	7	15	56	222
Typhoid and paratyphoid fever		1		7		1		1	1	11
Undulant fever				13	1			3	1	18
Venereal diseases:										
Gonorrhea	3	22	12	108	92	41	38	56	98	470
Syphilis	1	6	10	110	82	17	6	7	47	286
Whooping cough				38	56	39	7	1	21	162

FINLAND

Notifiable diseases—December 1946.—During the month of December 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	10	Paratyphoid fever	282
Diphtheria	1,063	Poliomyelitis	15
Dysentery	10	Scarlet fever	216
Gonorrhea	1,310	Syphilis	418
Lymphogranuloma inguinale	1	Typhoid fever	26
Malaria	2		

NEW ZEALAND

Notifiable diseases—4 weeks ended January 25, 1947.—During the 4 weeks ended January 25, 1947, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	8	1	Poliomyelitis	3	1
Diphtheria	58	1	Puerperal fever	10	1
Dysentery:			Scarlet fever	56	
Amebic	1		Tetanus	2	
Bacillary	6		Trachoma	1	
Erysipelas	12		Tuberculosis (all forms)	187	53
Food poisoning	1		Typhoid fever	5	1
Malaria	3		Undulant fever	2	
Ophthalmia neonatorum	2				

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From consular reports, international health organizations, medical officers of the Public Health Service, 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]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–December 1946	January 1947	February 1947—week ended—			
				1	8	15	22
ASIA							
Afghanistan	C	35					
Burma	C	1,543	2				
Bassein	C	29					
Moulmein	C	204					
Rangoon	C	23					
Ceylon	C	110					
China:							
Anhwei Province	C	2,749					
Chekiang Province	C	4,680					
Formosa, Island of	C	3,432					
Fukien Province	C	1,465					
Foochow	C	712					
Honan Province	C	1,878					
Hopeh Province	C	397					
Hunan Province	C	2,040					
Hupeh Province	C	360					
Ichang Province	C	147					
Kiangsi Province	C	1,594					
Kiangsu Province	C	[1] 9,752					
Shanghai	C	[1] 4,583					
Kwangsi Province	C	956					
Kwangtung Province	C	4,845					
Canton	C	2,002					
Hong Kong	C	505					
Kweichow Province	C	8					
Macao, Island of	C	2					
Shantung Province	C	225					
Szechwan Province	C	162					
Yunnan Province	C	17					
India	C	72,740	2,701				
Bombay	C	[2] 2					
Calcutta	C	1,925	118	63	54	61	
Cawnpore	C	45					
Chittagong	C	8					
Madras	C	5					
India (French)	C	4	30				
Indochina (French):							
Cambodia	C	508	230				
Cochinchina	C	911	48				
Bien Hoa	C	24					
Chaudok	C	21					
Mytho	C	144					
Rachgia	C	1					
Saigon-Cholon	C	88	15	2	1	6	
Vinh-long	C	16	4				
Laos	C	49					
Japan	C	1,229					
Korea (Chosen)	C	[3] 11,351					
Malay States	C	245					
Manchuria	C	18,554					
Mongolia	C	16					
Siam (Thailand)	C	4,379	527	135	166		
Bangkok	C	584	175	30	15		
Straits settlements: **Singapore**	C	[2] 1					

[1] Includes imported cases.
[2] Imported.
[3] From the beginning of the outbreak in April or May to approximately Sept. 1, 1946.

PLAGUE

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

Place		January–December 1946	January 1947	February 1947—week ended— 1	8	15	22
AFRICA							
Algeria	C	2					
Bechuanaland	C	21					
Belgian Congo	C	[1] 35					
British East Africa:							
Kenya	C	38		1			
Uganda	C	12					
Egypt	C	217					
Alexandria	C	126					
Ismailiya	C	27					
Matariya	C	12					
Port Said	C	19					
Suez	C	32					
Libya: Tripolitania—Plague-infected rats		1					
Madagascar	C	282	33	1			
Union of South Africa	C	7	1	8			
ASIA							
Burma	C	1,703	380	103	125		
Bassein	C	23	[2] 1				
Mandalay	C	1	7				
Rangoon	C	154				1	
China:							
Chekiang Province	C	733					
Formosa, Island of	C	11					
Fukien Province	C	4,392					
Amoy	C	307					
Foochow	C	1,403					
Kiangsi Province	C	285					
Kwangtung Province	C	415					
Yunnan Province	C	352					
India	C	21,705	10,065				
Indochina (French):							
Annam	C	4	3				
Cochinchina	C	48		1			
Java	D	[3] 2,409					
Manchuria	C	[4] 316					
Palestine	C	17	1				
Siam (Thailand)	C	41	8	1	3		
EUROPE							
Great Britain: Malta, Island of	C	6					
Portugal: Azores	C	[5] 23	1				
NORTH AMERICA							
Canada.[6]							
SOUTH AMERICA							
Argentina:							
Buenos Aires	C	8					
Cordoba Province	C	1					
Bolivia:							
Chuquisaca Department	C	1					
Santa Cruz Department	C	12					
Tarija Department—Plague-infected rats	P						
Brazil:							
Alagoas State	C	2					
Bahia State	C	33					
Ceara State	C	125					
Minas Geraes State	C	12					
Parahyba State	C	18					
Pernambuco State	C	35					
Sergipe State	C	1					
Ecuador:							
Chimborazo Province	C	7	1				
Loja Province	C	38					

See footnotes at end of table.

PLAGUE—Continued

Place		January–December 1946	January 1947	February 1947—week ended— 1	8	15	22
SOUTH AMERICA—continued							
Peru:							
Lambayeque Department	C	15					
Libertad Department	C	8					
Lima Department	C	29					
Piura Department	C	63					
Tumbes Department	C	1					
Plague-infected rats	P						
Venezuela	C	1					
OCEANIA							
Hawaii Territory: [7] Plague-infected rats		7					

[1] Includes 16 cases of pneumonic plague.
[2] Imported.
[3] Unofficially reported.
[4] Includes 52 cases of pneumonic plague.
[5] Includes 2 cases of pneumonic plague.
[6] The imported suspected case previously reported has not been confirmed. Under date of Sept. 14, 1946, plague infection was reported in a pool of fleas from squirrels in Alsask and in a pool of fleas from squirrels in Superb, Saskatchewan, Canada.
[7] Plague infection was also proved in Hawaii Territory as follows: On Feb. 5, 1946, in a pool of 29 rats; on Apr. 13, 1946, in a pool of 54 fleas and 15 lice recovered from 7 rats and 22 mice; under date of July 3, 1946, in a pool of 50 fleas recovered from 7 rats and 46 mice, and in a pool of 51 fleas recovered from 10 rats; under date of July 17, 1946, in a pool of 48 fleas recovered from 22 rats, and in a pool of 56 fleas recovered from 33 rats; under date of Sept. 12, 1946, in a pool of 48 fleas recovered from 22 rodents; under date of Oct. 9, 1946, in a pool of 36 rats found on Sept. 10, 1946; on Jan. 9, 1947, in a pool of 31 rats.

SMALLPOX

[C indicates cases; P, present]

AFRICA							
Algeria	C	393	44				
Angola	C	184					
Basutoland	C	46					
Bechuanaland	C	14					
Belgian Congo	C	[1] 3,483	[1] 64	[1] 11	[1] 40		
British East Africa:							
Kenya	C	893	27	11	12		
Nyasaland	C	745	76	19	31	31	
Tanganyika	C	6,760	50				
Uganda	C	574	30	6			
Cameroon (French)	C	96	1				
Dahomey	C	1,591	12				
Egypt	C	405	17	2			
Eritrea	C	[1] 23					
French Equatorial Africa	C	163					
French Guinea	C	935	1				
French West Africa: Dakar District	C	40					
Gambia	C	7					
Gold Coast	C	1,552	170	40			
Ivory Coast	C	1,651	190				
Liberia	C	237	11				
Libya	C	923	266	72	60		
Madagascar	C	1					
Mauritania	C	1	17				
Morocco (French)	C	1,890	24		[2] 6		
Morocco (Int. Zone)	C	178					
Morocco (Spanish)	C	5					
Mozambique	C	4					
Nigeria	C	6,157					
Niger Territory	C	563	91				
Rhodesia:							
Northern	C	436	2				
Southern	C	148	1	1			
Senegal	C	95	4				
Sierra Leone	C	500					
Somaliland (Italian)	C	1					
Sudan (Anglo-Egyptian)	C	56	[1] 10	[1] 2		[1] 4	
Sudan (French)	C	2,041	87				
Swaziland	C	4	9				
Togo (French)	C	361	45				
Tunisia	C	376					
Union of South Africa	C	675	P		P	P	

See footnotes at end of table.

SMALLPOX—Continued

Place		January–December 1946	January 1947	February 1947—week ended— 1	8	15	22
ASIA							
Arabia	C	4					
Burma	C	1,981	223	83	106		
Ceylon	C	546	1				
China	C	2,687	354	58	47	39	
India	C	60,453	3,217				
India (French)	C	3					
India (Portuguese)	C	19	1				
Indochina (French)	C	2,377	373				
Iran	C	34	2				
Iraq	C	22					
Japan	C	17,800	67		5		
Malay States	C	2,973	810	310			
Manchuria	C	2					
Palestine	C	[3] 2					
Rhodes, Island of	C	[3] 1					
Siam (Thailand)	C	17,775	251	51	64		
Straits Settlements	C	204	44	14	5	9	
Syria and Lebanon	C	9					
Turkey (see Turkey in Europe).							
EUROPE							
Czechoslovakia	C	24					
France	C	16					
Germany	C	1					
Gibraltar	C	[3] 3					
Great Britain:							
England and Wales	C	[4] 53			8		
Malta, Island of	C	10					
Scotland	C	2					
Greece	C	114					
Italy	C	654					
Portugal	C	58	2	1			
Spain	C	9	11				
Turkey	C	17					
Yugoslavia	C	1					
NORTH AMERICA							
Canada	C	2					
Guatemala	C	56					
Honduras	C	4					
Mexico	C	397					
Nicaragua	C	3					
SOUTH AMERICA							
Argentina	C	69					
Bolivia	C	918					
Brazil	C	[1] 518	[1] 13	[1] 2		[1] 2	
Colombia	C	1,071	159				
Ecuador	C	120	19				
Paraguay	C	397	[1] 82				
Peru	C	536					
Uruguay	C	52					[1] 138
Venezuela	C	[1] 1,771	[1] 66				
OCEANIA							
Hawaii Territory	C	[5] 1					

[1] Includes alastrim.
[2] For the period Feb. 1–10, 1947.
[3] Imported.
[4] Includes imported cases.
[5] Off-shipping.

TYPHUS FEVER*

[C indicates cases; P, present]

Place		January–December 1946	January 1947	February 1947—week ended— 1	8	15	22
AFRICA							
Algeria	C	843	15				
Basutoland	C	11	1				
Belgian Congo [1]	C	2,570	27	8	7		
British East Africa:							
Kenya	C	26	1				
Uganda	C	1	1				
Egypt	C	1,525	13	1			
Eritrea	C	1,407	104	30	18		
French West Africa: Dakar District	C	7					
Gold Coast	C	1					
Libya	C	88	1				
Madagascar [2]	C	1					
Morocco (French)	C	3,786	39				
Morocco (Int. Zone)	C	59					
Morocco (Spanish)	C	27					
Nigeria	C	34					
Rhodesia, Northern	C	2					
Sierra Leone [1]	C	6					
Tunisia [1]	C	280					
Union of South Africa [1]	C	542	P	P	P	P	
ASIA							
Arabia [2]	C	2					
Burma [1]	C	4	2				
China [1]	C	395	2	2			
India	C	303					
Indochina (French)	C	70					
Iran	C	151	3				
Iraq	C	219	13	3	3		
Japan	C	31,141	240		48		
Malay States	C	3					
Manchuria	C	90					
Palestine [1]	C	121					
Philippine Islands [1]	C	4					
Straits Settlements	C	3	1				
Syria and Lebanon	C	86	1				
Trans-Jordan	C	21					
Turkey. (See Turkey in Europe.)							
EUROPE							
Albania	C	140					
Austria	C	35		1			
Belgium [1]	C	14					
Bulgaria	C	1,120	149				
Czechoslovakia [1]	C	799	2				
France [1]	C	16	3				
Germany	C	1,873	3	1			
Gibraltar [2]	C	1					
Great Britain:							
England and Wales	C	1					
Malta and Gozo [1]	C	32			1		
Greece [1]	C	631	25	5	3	8	
Hungary	C	1,115	80	26	24		
Italy	C	29		1			
Netherlands [1]	C	29					
Poland	C	3,430	65				
Portugal	C	14	1				
Rumania	C	8,735	1,448	337			
Spain	C	28	2				
Canary Islands	C	2					
Sweden [2]	C	1					
Switzerland [1]	C	2	1				
Turkey	C	1,412	101	21	42	24	
Union of Soviet Socialist Republics: Ukraine	C	P					
Yugoslavia	C	3,040					

See footnotes at end of table.

TYPHUS FEVER—Continued

Place		January–December 1946	January 1947	February 1947—week ended— 1	8	15	22
NORTH AMERICA							
Costa Rica [2]	C	123	9	2	1		3
Cuba [2]	C	18					
Guatemala	C	779					
Jamaica [2]	C	41			1		
Mexico	C	1,928					
Nicaragua [2]	C	1					
Panama Canal Zone	C	1					
Panama (Republic)	C	4	1				
Puerto Rico [2]	C	105	3	1	2		
Salvador	C	1					
Virgin Islands [2]	C	3					
SOUTH AMERICA							
Argentina	C	7					
Bolivia	C	254					
Brazil [1]	C	17					
Chile	C	561					
Colombia	C	973	127				
Curacao [2]	C	1					
Ecuador [1]	C	1,096	46				
Paraguay	C	7					
Peru	C	1,123					
Venezuela [1]	C	112	5				
OCEANIA							
Australia [2]	C	153	6				
Hawaii Territory [2]	C	89	5	1		2	

Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Includes cases of murine type.
[2] Murine type.

YELLOW FEVER

[C indicates cases, D, deaths]

AFRICA							
French Equatorial Africa: Carnot	C	[1] 8					
Ivory Coast: Seguela	C	1					
Nigeria:							
Ibadan	C	1					
Ilorin	C	1					
Kafanchan	C	2					
Ogbomosho	C	41					
Sierra Leone: Pujehan	C	1					
SOUTH AMERICA							
Bolivia: Santa Cruz Department	D	[2] 40					
Brazil: Para State	D	1					
Colombia:							
Antioquia Department	D	1					
Caldas Department	D						1
Caqueta Territory	D	2					
Cundinamarca Department	D		1				
Magdalena Department	D	1					
Santander Department	D	17	9			3	
Tolima Department	D		1				
Peru: San Martin Department	D	3					
Venezuela:							
Tachira State	C	4					
Trujillo State	C	4					
Zulia State	C	4					

[1] Includes 3 suspected cases.
[2] Diagnosis confirmed in 14 cases and 10 deaths.