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STUDIES OF THE ACUTE DIARRHEAL DISEASES

X A. CULTURAL OBSERVATIONS ON THE RELATIVE EFFICACY OF SULFONAMIDES IN *SHIGELLA DYSENTERIAE* INFECTIONS[1]

By ALBERT V. HARDY, *Surgeon (R)*, WILLIAM BURNS, *Associate Bacteriologist*, and THELMA DECAPITO, *Assistant Bacteriologist, United States Public Health Service*

The response of *Shigella dysenteriae* (Flexner and Newcastle) infections to sulfaguanidine was described in a previous communication.[2] In 68 treated cases, all but 6 were negative by the fourth day, and the last positive culture was on the tenth day. During the present study 501 cases or carriers were treated. At first only sulfaguanidine and sulfasuxidine were used, and 169 and 175 persons, respectively, were treated with these drugs. Later, sulfadiazine and sulfathiazole were included, 95 and 62 persons, respectively, receiving these preparations.

The cases and carriers were observed in nonexplosive outbreaks in New York State institutions. The varieties of *Shigella* found in three of these were, respectively, Flexner W, Flexner Z, and Sonne. In the fourth, Schmitz, Flexner W, and Sonne appeared in succession. For purposes of this analysis only those individuals were included who were culturally positive on the test immediately before the beginning of medication or, if negative on this test, with a preceding positive test within 3 days and a subsequent positive examination during the first 48 hours of treatment. The controls were similarly selected considering the day on which treatment would have been started. Fifty of the treated individuals were infected with Flexner W, 96 with Flexner Z, 177 with Sonne, and 178 with Schmitz. The Flexner Z infections were chiefly cases, the others chiefly carriers.

The outbreaks were confined largely to certain wards or buildings in which a relatively high percentage of the inmates became infected. Each unit housed individuals with the same general type of mental

[1] From the Divisions of Infectious Diseases and Public Health Methods, National Institute of Health. Arrangements for this study were made through the New York State Departments of Health and Mental Hygiene.

[2] Hardy, A. V., Watt, James, Peterson, Jerome, and Schlosser, Elise: Studies of the acute diarrheal diseases. VIII. Sulfaguanidine in the control of *Shigella dysenteriae* infections. Pub. Health Rep., 57:529–535 (Apr. 10, 1942).

disorder or defect. Thus, comparatively homogeneous groups living under similar conditions and infected with a particular variety and strain of *Shigella* were treated in a uniform manner with different sulfonamides. The 4 preparations were prescribed in rotation for Flexner Z, for about one-half of the Sonne, and for 24 of the Schmitz cases. In the remainder of the Sonne and Schmitz infections, the different sulfonamides were assigned to comparable groups in the same institutions. Those treated with sulfaguanidine and sulfasuxidine for Flexner W were in different institutions.

Cases of acute diarrhea were reported each morning and specimens for culture were taken immediately; carriers were discovered by cultural surveys. Routinely, two examinations were obtained before treatment, one immediately prior to the first dose of medication. Those receiving sulfonamides were cultured daily. Treatment was terminated with the second successive negative plate and the daily cultures were discontinued following a third negative examination. Follow-up examinations were obtained through repeated surveys of all persons in the infected ward or building.

TABLE 1.—*Average colony* [1] *counts per S. S. agar plate (inoculated directly by rectal swabs from cases and carriers) by variety of* Shigella dysenteriae *and the type and duration of chemotherapy*

Number of days before and after beginning chemotherapy	Variety of *Shigella dysenteriae*													
	Flexner Z				Sonne					Schmitz				
	Sulfonamide compounds used in treatment													
	Guan.	Sux.	Diaz.	Thiaz.	Guan.	Sux.	Diaz.	Thiaz.	None	Guan.	Sux.	Diaz.	Thiaz.	None
	Total number of cases and carriers													
	20	26	25	25	34	48	64	31	16	108	58	6	6	35
	Average colony counts per S. S. agar plate													
Before treatment:														
0-3	444	242	338	330	477	588	565	526	393	511	547	421	317	328
After treatment:														
1	59	104	48	229	425	379	266	287	438	212	218	7	11	280
2	65	72	13	40	74	68	67	112	398	73	39	0	0	254
3	56	8	0	1	40	30	60	105	409	20	2	0	0	226
4	16	0	0	0	5	6	34	7	602	11	12	0	0	120
5	0	0	0	0	32	5	23	13	360	10	6	0	0	94

[1] Suspicious colorless colonies of which the picked representatives proved to be *Shigella dysenteriae*.

Guan.=sulfaguanidine. Diaz.=sulfadiazine.
Sux.=sulfasuxidine. Thiaz.=sulfathiazole.

Specimens were obtained by rectal swabs and were inoculated directly to S. S. (*Shigella–Salmonella*) agar plates. Suspicious colonies were counted or, if numerous, the approximate number was estimated. Representative colorless colonies were picked to Krum-

weide's triple sugar agar. One isolation from each individual was classified by detailed cultural and serological tests; the others were identified by limited cultural examinations and by serological tests.

The dosage of sulfaguanidine and sulfasuxidine given adults was an initial 10 gm. followed by 5 gm. three or four times daily; the initial dose of sulfadiazine and sulfathiazole was 4 gm. followed by 1 gm. three, four or, in one group, six times daily. Children (all weighing under 75 pounds) were given one-half of these doses. There were no infants in this series.

TABLE 2.—*The relative rapidity of action of the sulfonamides as indicated by the proportion of cases in which the colony*[1] *counts were reduced by more than one-half during the first 24 hours of chemotherapy*

	Variety of *Shigella dysenteriae*													
	Flexner Z				Sonne					Schmitz				
	Sulfonamide compound used in treatment													
	Guan.	Sux.	Diaz.	Thiaz.	Guan.	Sux.	Diaz.	Thiaz.	None	Guan.	Sux.	Diaz.	Thiaz.	None
Total number of cases	14	24	20	21	30	44	52	29	16	73	46	6	6	34
Cases in which counts were reduced by more than one-half in first 24 hours of treatment:														
Number	9	12	16	11	12	21	34	13	2	48	33	6	6	5
Percent	64	50	80	52	40	48	65	45	13	66	72	100	100	15

[1] Suspicious colorless colonies of which the picked representatives proved to be *Shigella dysenteriae*.
Guan.=sulfaguanidine. Diaz.=sulfadiazine.
Sux.=sulfasuxidine. Thiaz.=sulfathiazole.

The response to treatment is shown in three tables. The average counts of suspicious colonies for the two examinations before medication and the daily cultures during treatment are recorded in table 1. Table 2 indicates the relative rapidity of the responses. This gives the number and percent of cases in which the counts at the end of 24 hours of treatment and on all subsequent tests were less than one-half of the pretreatment findings. Lastly, in table 3 the persistence of the infection is indicated. Here the individual was counted as infected through the day on which the last positive culture was obtained. The findings on Sonne and Schmitz control groups are included in all tables, and those for untreated Flexner and Newcastle cases, as previously reported, are shown in table 3.

A comparison of the control and treated series reveals that all four sulfonamides markedly modified the course of these *Shigella* infections. Under treatment cases and carriers were rarely positive for as long as 1 week, whereas those observed earlier in our studies before sulfonamides were being used were rarely negative at the end of 1 week.

TABLE 3.—*Percent of individuals with persisting positive cultures by variety of* Shigella dysenteriae *and the type and duration of chemotherapy*

Number of days after beginning chemotherapy	Variety of *Shigella dysenteriae*																	
	Flexner W		Flexner Z					Flexner & Newcastle	Sonne					Schmitz				
	Sulfonamide compound used in treatment																	
	Guan.	Sux.	Guan.	Sux.	Diaz.	Thiaz.	None	Guan.	Sux.	Diaz.	Thiaz.	None	Guan.	Sux.	Diaz.	Thiaz.	None	
	Total number of cases and carriers																	
	7	43	20	26	25	25	29	34	48	64	31	16	108	58	6	6	35	
	Percent of individuals with positive cultures																	
0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
1	100	61	70	54	60	52	90	79	85	89	81	94	75	60	17	33	97	
2	100	40	50	23	32	8	90	74	54	56	65	94	52	24	0	0	91	
3	14	16	35	19	12	8	90	38	29	36	48	94	30	14	0	0	86	
4	0	5	35	12	0	4	86	21	10	20	39	87	15	7	0	0	86	
5	0	2	10	4	0	4	86	12	6	17	26	75	9	3	0	0	77	
6	0	0	5	0	0	0	86	9	6	16	16	69	7	2	0	0	66	
7	0	0	5	0	0	0	86	9	4	11	10	63	4	2	0	0	66	

Guan.=sulfaguanidine. Diaz.=sulfadiazine.
Sux.=sulfasuxidine. Thiaz.=sulfathiazole.

All tests indicate that Sonne infection was less sensitive to the different sulfonamides than Flexner or Schmitz.

There were moderate variations only in the efficacy of the four sulfonamides. Considering all evidence, sulfasuxidine was more effective than sulfaguanidine, and sulfadiazine was better than sulfathiazole. The two readily absorbed sulfonamides were more effective than the two poorly absorbed preparations in Flexner Z infections. The four sulfonamides were compared in only the last 24 Schmitz infections. Sulfadiazine and sulfathiazole both gave better results than the other two. The character of the response in Sonne infections differed. By the end of the first 24 hours sulfadiazine had changed heavy infections to relatively light ones, though most of the cultures were still positive. In contrast, during this time colony counts were not reduced significantly by sulfaguanidine. At the end of the second and third days the response to sulfathiazole was least satisfactory, and there was slight variation in the cultural findings on the groups treated with the other three sulfonamides. Later than this the advantage was in favor of the poorly absorbed sulfonamides, particularly sulfasuxidine. Thus, in this series, sulfadiazine was the most effective in rapidly controlling the massive Sonne infections usually found in clinical cases but was less effective than sulfasuxidine in eradicating these organisms from convalescent and passive carriers.

The dosage of sulfadiazine and sulfathiazole was varied in Sonne infections. At first the stated dose was given three times daily. For the latter one-half of the cases the same amount was given six times daily. This did not modify appreciably the response to sulfadiazine but did appear to improve the results with sulfathiazole.

Infected individuals could be isolated only as a group, not individually. A reappearance of the infection after treatment, which was observed in a few cases, could be interpreted either as a recurrence or as a reinfection. An evaluation of treatment on the basis of the frequency of recurrences was not possible.

Symptoms were controlled by each of the four sulfonamides, but conditions were not favorable for the collection of the detailed clinical data needed for comparative studies.

No toxic reactions were reported, though minor disturbances might have occurred and remained undetected.

These cultural data reveal differences in the bacteriostatic action of the sulfonamides on *Shigella dysenteriae*. Sulfadiazine stood first in rapidity of action and would be judged the most promising for the treatment of clinical infections due to the varieties of *Shigella* encountered in this country. Sulfasuxidine was more effective than sulfaguanidine and was superior to sulfadiazine in convalescent and passive carriers of Sonne.

Preliminary observations on the clinical response to sulfadiazine are reported in the following paper of this series.

STUDIES OF THE ACUTE DIARRHEAL DISEASES

X B. A PRELIMINARY NOTE ON THE CLINICAL RESPONSE TO SULFADIAZINE THERAPY[1]

By Albert V. Hardy, *Surgeon (R), United States Public Health Service,* and Sam D. Cummins, *Resident in Pathology and Medicine, Shreveport Charity Hospital*

The cultural observations reported in the preceding paper of this series indicate that sulfadiazine is a somewhat more effective bacteriostatic agent than sulfathiazole, sulfasuxidine, or sulfaguanidine for the varieties of *Shigella dysenteriae* encountered in this country. As comparative clinical data could not be obtained in that study which was limited to institutional inmates, a separate investigation was undertaken on mentally normal individuals with severe acute diarrheal disease. The first cases were all given sulfadiazine. Additional treatment included fluids for dehydration, and mild sedatives for restlessness and cramps. The findings on the 21 cases observed during September and October 1942 are reported here.

[1] From the Division of Infectious Diseases, National Institute of Health, and the Shreveport Charity Hospital, Shreveport, La.

The color, sex, and age of the patients are given in table 1. There was a wide range in age—eight under 1 year, five between 1 and 4 years, and eight adults.

TABLE 1.—*Color, sex, and age of patients, nature of the cases of acute diarrhea which were treated with sulfadiazine, and clinical and bacteriological response to treatment*

Patient	Color	Sex	Age	Diagnosis as to etiology	Severity on admission	Duration on admission	Temperature			
							Before treatment	During treatment after—		
								12 hrs.	24 hrs.	48 hrs
N. L.	W	F	6 mo.	Flexner	Moderate	1 wk.	99.4	98	N	N
K. S.	W	M	8 mo.	do	do	10 dy.	101.4	N	N	N
B. S.	C	M	8 mo.	do	Severe	5 dy.	102	99	99.8	101.6
T. L.	W	F	9 mo.	do	do	3 dy.	104.8	102.4	N	N
L. W.	C	M	11 mo.	do	Critical	6 dy.	102.8	100	N	N
R. S.	C	M	1 yr.	do	Severe	24 hr.	105.8	100.6	N	N
A. B.	C	F	2 yr.	do	do	12 hr.	105.2	101	100.6	N
T. W.	W	M	18 yr.	do	do	4 dy.	99.4	99	N	N
L. R.	C	F	64 yr.	do	do	3 dy.	102	99	99.2	N
B. B.	C	M	64 yr.	do	do	7 dy.	100.4	99.8	N	N
E. M.	C	F	18 mo.	Sonne	do	8 hr.	104.6	N	N	N
H. H.	C	F	2 yr.	do	Moderate	14 hr.	104.8	100.8	N	N
H. H.	W	M	38 yr.	do	do	8 mo.	N	N	N	N
R. W.	C	F	65 yr.	do	do	2 dy.	100	N	N	N
A. W.	W	M	11 mo.	Bacillary dysentery.	Critical	2 dy.	103.2	N	N	N
O. A.	C	F	4 yr.	do	Mild	14 dy.	N	N	N	N
J. B.	C	F	20 yr.	do	do	4 dy.	102.2	98.4	100.4	N
L. R.	C	M	42 yr.	do	Moderate	2 dy.	100.4	N	N	N
D. B.	C	F	3 mo.	Unknown	Critical	3 dy.	101.8	99.6	100	N
B. G.	W	M	4 mo.	do	do	3 dy.	101.4	101	102.6	100.2
A. G.	C	M	45 yr.	do	do	2 dy.	100.6	N	N	N

Number of stools in 24 hrs.		Counts of suspicious colonies per S. S. agar plate						Patient
Before treatment	During second day of treatment	Before treatment	During the specified day of treatment					
			1	2	3	4	5	
Every half hour	1	1000	10	0	0	0	0	(N. L.)
6 to 8	N	500	0	0	0	-----	-----	(K. S.)
Many	N	No culture	4	0	0	0	0	(B. S.)
Numerous	8	do	75	0	0	0	0	(T. L.)
12	4	No count	-----	-----	-----	-----	-----	(L. W.)
Many	N	Overgrown	25	Very few	0	0	-----	(R. S.)
Every 2 hours	N	No count	-----	-----	-----	-----	-----	(A. B.)
Numerous	N	1000's	3	2	4	4	3	(T. W.)
Do	N	1000's	6	0	0	0	0	(L. R.)
Do	12	1000's	200	25	1	0	0	(B. B.)
Hourly	N	1000's	1000	0	0	-----	-----	(E. M.)
Few	N	1000's	500	1000	50	0	0	(H. H.)
14	3	1000	Overgrown	Overgrown	200	500	0	(H. H.)
10	N	1000's	500	50	8	1	2	(R. W.)
Hourly	4	0	0	0	0	-----	-----	(A. W.)
Every 30 minutes	N	0	0	0	0	-----	-----	(O. A.)
7	N	0	0	0	0	-----	-----	(J. B.)
Continuous	N	0	0	0	0	-----	-----	(L. R.)
Unknown	N	0	0	0	0	-----	-----	(D. B.)
7	7	0	0	0	0	-----	-----	(B. G.)
Continuous	3	0	0	0	0	-----	-----	(A. G.)

The etiology was determined by positive cultures in 14 cases as shown in the table. The diagnosis of bacillary dysentery was accepted on clinical and epidemiological grounds in 4 others. In 3, the cause of the diarrhea was not discovered. On admission, 5 patients were

in a critical condition, 8 were severely ill, 6 moderately so, and 2 mildly ill. The last two were admitted late, apparently at the beginning of convalescence. The illnesses had persisted from 8 hours to 1 week in 19 cases, for 2 weeks in one case, and there had been recurrent attacks for 8 months in one case.

The response to treatment is indicated in table 1 by the temperature, numbers of stools, and the *Shigella dysenteriae* colony counts before medication and at stated intervals during treatment. The temperatures of children under 5 years of age were taken by rectum, of others by mouth. It is recorded as normal (N) when the particular reading and the following ones did not exceed 99° F. by mouth or 100° F. by rectum. All temperatures due to uncomplicated *Shigella* infections were normal at 48 hours (B. S. had a concurrent otitis media), and all but three at 24 hours. The majority were reduced to low grade elevations within 12 hours.

The diarrhea was severe before treatment in most of the cases, though a statement of the number of stools was not always obtainable. During the first 24 hours of medication there was a rapid decline in the number of watery fecal stools. The response was slower in those with bloody muco-purulent discharges and, presumably, extensive ulcerations. During the second day of treatment and subsequently, 14 (67 percent) had normal stools with at most two movements which were free of gross exudate (recorded "N" in table). The remaining 7 had from 3 to 12 stools on the second day but in these there was a return to normal on the third, fourth, or fifth days of treatment.

The general clinical condition improved with the decline in temperature and the reduction in number of stools. It required time to overcome the severe dehydration observed in the children. In adults, abdominal cramps were sometimes annoying up to the third or fourth day of treatment. However, the critically ill infants and the very uncomfortable adults showed marked improvement within 6 to 12 hours, and all progressed to an uneventful recovery.

Stool cultures were positive in 14 cases, but in 2 of these the pretreatment specimen was not obtained and in 2 the daily swabs were not taken. The cultures with thousands (recorded "1000's" in table) of colonies per plate usually had areas of confluent clear growth and very many small, colorless colonies. This evidence of a massive infection soon disappeared with treatment as is shown in the table.

One patient (B. S.) with proved bacillary dysentery had concurrently an otitis media. There may have been a respiratory infection in the two infants in whom the cause of the diarrhea was unknown. An advantage of sulfadiazine in these diseases is its effectiveness in parenteral infections which may account for diarrhea.

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A review of cases of comparable severity treated with sulfaguanidine during the preceding year revealed that the clinical response had been slower and less consistent.

The prevailing medical opinion favors the use of poorly absorbed sulfonamides for the treatment of bacillary dysentery and other clinically similar diarrheal disorders. The cultural and clinical findings reported in this and the preceding paper of the series indicate that sulfadiazine is a promising chemotherapeutic agent for these enteric diseases. In selecting sulfonamides for clinical trial or for critical evaluation the readily absorbed sulfonamides as well as the poorly absorbed preparations must be considered.

STUDIES OF THE ACUTE DIARRHEAL DISEASES

XI. THE TYPING OF *SHIGELLA DYSENTERIAE* FLEXNER[1]

By ALBERT V. HARDY, *Surgeon (R)*, JAMES WATT, *Passed Assistant Surgeon*, and THELMA DECAPITO, *Junior Bacteriologist, United States Public Health Service*

The members of the *Shigella dysenteriae* group of organisms are usually identified serologically by polyvalent antiserums and typed by agglutinin absorption. The first has limited value in epidemiological work as it does not distinguish between varieties; the latter is a laborious and time-consuming technique.

The agglutination procedure described below has been used in our laboratories for 5 years and has been an essential part of our method of study. It is based primarily on the V, W, X, Y, and Z classification of Andrewes and Inman (*1*). Later work (*2*) has shown that there are probably only three valid types in this group of five but this has not affected the usefulness of the method. (An organism has never been encountered which would be classed as X or Y by this method.) Early in the use of the test it was found that the agglutination by the Y antiserum did not contribute to the interpretation of results and it is no longer used.

TECHNIQUE

1. High titre antiserums are prepared by inoculation of rabbits with Flexner types V, W, X, and Z. Stock cultures used were obtained from the Bureau of Standards Laboratory, Oxford, England. High titre serums (1–6400 and up) are desirable since they usually provide a sharp endpoint in a titration. The method of production described by Havens (*3*) has been satisfactory in our experience.

2. Antigens, both stock and unknown, are grown on beef infusion agar for 24 hours, then suspended in formalized saline (0.5 percent

[1] From the Division of Infectious Diseases, National Institute of Health.

formalin) and adjusted to the turbidity of MacFarland's nephelometer, tube No. 3.

3. The antiserums are diluted in geometric progression on the day they are to be used. This is done in a series of glasses or large test tubes to assure uniformity of dilution.

4. 0.5 cc. of each dilution of the four antiserums is added to 0.5 cc. of antigen, shaken, incubated at 56° for 4 hours, and left overnight at room temperature before reading.

In our work it has been convenient to use six dilutions of each antiserum. A larger or smaller number may be used but it would not be safe to use less than five dilutions because of the variation in agglutinability of different strains. The fifth tube of each six-tube set-up represents the titre of the serum. Using high titre serum and perfect technique, the reading of the control, which is done with each day's run of unknowns, would be 444440. Actually some slight variation from this occurs and the readings of unknowns are adjusted according to whether the control is below or above this standard. Thus if the V control reads 444420, all readings for unknowns against the V antiserum on that day are increased by an equivalent amount. If the control should be higher, the readings are correspondingly decreased. By using this adjusted reading, the results of one day are comparable with the results of any other day and with a standard.

APPLICATION AND INTERPRETATION

Two conditions should be met if this test is to serve as a substitue for agglutinin absorption: (1) It must separate satisfactorily the Flexner group into varieties. (2) These varieties must be easily and accurately identified according to the nomenclature currently in use.

The first, actually of greatest epidemiological importance, was easily confirmed. The great majority of the Flexner organisms were found to possess one of three distinctive "agglutination patterns." In addition, two other patterns have been recognized which are apparently distinctive (table 1). These patterns have been quite constant in organisms isolated from the same individuals and their family contacts, as well as in several epidemics whose common source was indicated by investigation.

The second condition was checked by agglutinin absorption tests done on representative organisms by the more recently described polysaccharide precipitin test (*4*, *5*) and by a comparison of the biochemical reactions of all organisms studied (table 1). The first three patterns were easily identified with the V, W, and Z types of Andrewes and Inman by both absorption and precipitin tests. Organisms in the other two groups have been identified by absorption as W and Z, respectively. This test failed to distinguish between the two W and Z types.

The precipitin tests did indicate differences but it is not yet certain whether these are constant. Biochemically there were usually differential characteristics (table 1).

TABLE 1.—*Agglutination patterns of different types of* Shigella dysenteriae *Flexner and biochemical properties which aid in differentiation*

Type designation	Type by—		Antiserums	"Agglutination patterns" [3]			
	Agglutinin absorption	Polysaccharide [1] precipitin		Typical agglutination	Variations in agglutination		
V	V	V	V	4 4 4 4 4 0	4 4 4 0 0 0	4 4 4 4 4 0	4 4 4 1 4 2
			W	4 4 4 0 0 0	4 0 0 0 0 0	4 4 4 0 0 0	4 4 4 0 0 0
			X	4 4 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
			Z	4 4 4 4 0 0	4 4 2 0 0 0	4 4 4 4 4 0	4 4 4 4 4 0
W	W	W	V	4 0 0 0 0 0	0 0 0 0 0 0	4 4 0 0 0 0	0 0 0 0 0 0
			W	4 4 4 4 4 0	4 4 4 4 0 0	4 4 4 4 4 4	4 4 4 4 4 4
			X	2 0 0 0 0 0	0 0 0 0 0 0	4 0 0 0 0 0	0 0 0 0 0 0
			Z	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
Z	Z	Z	V	4 4 4 4 0 0	4 4 4 0 0 0	4 4 4 4 4 0	4 4 2 0 0 0
			W	2 0 0 0 0 0	0 0 0 0 0 0	4 4 2 0 0 0	0 0 0 0 0 0
			X	4 4 4 2 0 0	4 4 2 0 0 0	4 4 4 4 0 0	4 4 4 2 0 0
			Z	4 4 4 4 4 0	4 4 4 4 0 0	4 4 4 4 4 4	4 4 4 4 4 4
W′	W	W [2]	V	4 4 4 2 0 0	4 2 0 0 0 0	4 4 4 4 4 1	4 4 1 0 0 0
			W	4 4 4 4 3 0	4 4 3 0 0 0	4 4 4 4 4 4	4 4 4 2 0 0
			X	4 4 4 1 0 0	4 1 0 0 0 0	4 4 4 4 4 1	4 4 1 0 0 0
			Z	4 4 2 0 0 0	1 0 0 0 0 0	4 4 4 4 2 0	4 0 0 0 0 0
Z′	Z	Z [2]	V	4 4 4 0 0 0	4 4 2 0 0 0	4 4 4 4 0 0	4 2 0 0 0 0
			W	4 4 4 4 0 0	4 4 4 2 0 0	4 4 4 4 2 0	4 4 4 2 0 0
			X	4 4 2 0 0 0	4 4 2 0 0 0	4 4 4 4 0 0	4 4 0 0 0 0
			Z	4 4 4 4 4 0	4 4 4 4 2 0	4 4 4 4 4 0	4 4 4 4 4 4

BIOCHEMICAL REACTIONS WITH DIFFERENTIAL VALUE

Type	Indol reaction	Fermentation of		Character of antigen
		Mannitol	Rhamnose	
V	Variable, usually negative to moderate, rarely strong.	+	−	Easy to keep smooth on artificial media.
W	Variable, usually slight to moderate, rarely strong.	+	−	Easy to keep smooth on artificial media.
Z	Strong	+	Frequently late (2–14 days).	Easy to keep smooth on artificial media.
W′	Strong	Frequently late (2–14 days).	−	Rough variants very common; suspension hard to prepare.
Z′	Variable, slight to moderate, rarely strong.	+	−	Easy to keep smooth on artificial media.

[1] Precipitin tests done by Luis M. Gonzales, School of Tropical Medicine, San Juan, P. R.
[2] Slightly atypical in their reaction. Further study being conducted.
[3] Serum dilutions adjusted so the end point for the homologous organism is at the second to the last tube. Figures represent the amount of agglutination.

Accurate interpretation will be facilitated if the following considerations are kept in mind:

1. The pattern is the important factor. Frequently the reading of an individual titration will show a reaction lower than the typical pattern, but this is almost always uniform, i. e., a corresponding lack

of sensitivity is found against all serums. Sample variations in the readings taken from our records are shown (table 1). As can be seen, whether the reading is higher or lower than normal, the pattern persists.

2. Sometimes the dilution of the serum may be such that the standard gives a reading much lower than the ideal of 444440. Usually this causes no difficulty in adjustment. Occasionally a day's readings will give a series of patterns which cannot be interpreted, and the whole series must be repeated. This can be avoided only by careful and regular titration of the antiserums against the control organisms and care in making the original dilutions of the serums.

3. In differentiating V and Z types, variations in the reactions in W and X antiserums are often of more significance than the differences between V and Z. The titers for the latter may be almost the same. A W titer higher than X indicates a V organism, and the reverse a Z.

4. Reference to the biochemical variations assists in interpretation. No one factor is conclusive, but taken together they aid substantially. The indol reaction is particularly useful (table 1).

Uncertainty in results not infrequently has been traced to faulty technique as, for example, when the stock strain developed rough variants. A few organisms still remain in the unclassified group, but with increasing experience these have steadily decreased. During the past year in Puerto Rico, unclassified strains were less than 0.5 percent of those studied.

This method has been used in four widely separated areas—New Mexico, Georgia, New York, and Puerto Rico—and in all it has been possible to classify satisfactorily the great majority of organisms isolated. The technique is much simpler than agglutinin absorption. It also has greater epidemiological value, since it revealed five varieties instead of the three which were indicated by the more laborious procedure.

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SPECIES OF FLEAS ON RATS COLLECTED IN STATES WEST OF THE 102D MERIDIAN AND THEIR RELATION TO THE DISSEMINATION OF PLAGUE

By FRANK M. PRINCE, *Assistant Entomologist, United States Public Health Service*

For several years the United States Public Health Service has conducted investigations to determine the extent and distribution of plague infection among rodents in the western States. The present study concerns the species of fleas found on 4,188 rats collected by trapping and shooting during a 6-year period (1935–1941) in rural areas and cities located west of the 102d meridian in 13 States.

The study indicates that rats are widely distributed throughout the area covered. The rats taken included the three common species, *Rattus norvegicus*, *Rattus rattus*, and *Rattus alexandrinus*. One or more of each of the three species were found in each of the 13 States. From the 4,188 rats a total of 5,785 fleas was taken.

The fleas included the 3 species commonly found on rats in coastal cities of the United States (*1*): *Xenopsylla cheopis*, *Nosopsyllus fasciatus*, and *Leptopsylla segnis*. In addition, 18 other species of fleas were collected. The various species represented are listed below:

ALPHABETICAL LIST OF FLEAS FOUND ON RATS TAKEN WEST OF THE 102D MERIDIAN

Anomiopsyllus sp. (Baker)
Ctenocephalides canis (Curtis)
Ctenocephalides felis (Bouche)
Diamanus montanus (Baker)
Echidnophaga gallinaces (Westwood)
Foxella ignotus (Baker)
Hoplopsyllus anomalus (Baker)
Leptopsylla segnis (Duges)
Malaraeus telchinum (Roths)
Megabothris abantis (Roths)
Megabothris lucifer (Roths)
Monopsyllus wagneri (Baker)
Nosopsyllus fasciatus (Bosc)
Opisocrostis labis (J & R)
Orchopeas nepos (Roths)
Orchopeas sexdentatus (Baker)
Oropsylla rupestris (Jordan)
Thrassis fotus (Jordan)
Thrassis howelli (Jordan)
Thrassis petiolatus (Baker)
Xenopsylla cheopis (Roths)

The close association between rats and field rodents which has been observed around human habitations in rural areas and around city garbage dumps, and the occasional use of field rodent burrows by rats, probably accounts for the finding of most of the fleas belonging to species not ordinarily regarded as rat fleas. While numerous observations have led to the conclusion that most species of fleas exercise considerable discrimination in selecting a host, it is well established that some species are able to thrive and reproduce when provided with hosts other than those which they normally inhabit.

The species and number of rats and fleas included in the study are recorded in table 1 according to the State, locality, and type of

environment in which the rat host was found. Since the collections of fleas were made primarily for the detection of plague, it was impractical to classify the total number obtained. Therefore, the number from each locality which was classified and that which was examined for infection by inoculation into animals is also included in the table.

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*

ARIZONA—1 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Prescott	Packing company	A	1	None	0	0	0
Phoenix	Stores, markets	R	11	*Xenopsylla cheopis*	9	0	9
		A	20				
Tucson	Garbage dump	N	26	None	0	0	0
Nogales	Buildings	N	89	*Xenopsylla cheopis*	1	0	1

CALIFORNIA—10 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Costa Mesa	Hog ranch	A	1	*Hoplopsyllus anomalus*	1	0	27
				Echidnophaga gallinacea	14		
				Orchopeas nepos	8		
		R	1	*Leptopsylla segnis*	4		
Santa Ana	do	A	1	None	0	0	0
Jamu	do	A	4	*Leptopsylla segnis*	8	0	8
		R	2				
Fresno	Markets	A	9	*Xenopsylla cheopis*	12	0	82
				Leptopsylla segnis	36		
				Diamanus montanus	1		
		N	3	*Echidnophaga gallinacea*	33		
Modesto	Slaughterhouse	A	1	*Nosopsyllus fasciatus*	3	0	3
San Diego	Garbage dump, Zoo, packing company, chicken yard, elevator	N	40	*Xenopsylla cheopis*	350	0	382
				Leptopsylla segnis	7		
				Nosopsyllus fasciatus	4		
				Echidnophaga gallinacea	20		
		R	2	*Ctenocephalides canis*	1		
Riverside	Hog ranch	N	11	*Xenopsylla cheopis*	1	0	34
		R	5	*Echidnophaga gallinacea*	33		
Palm City	do	N	22	*Xenopsylla cheopis*	57	0	102
				Leptopsylla segnis	4		
				Echidnophaga gallinacea	38		
				Foxella ignotus	2		
				Ctenocephalides felis	1		
Chula Vista	do	N	9	*Xenopsylla cheopis*	2	0	9
				Leptopsylla segnis	5		
				Echidnophaga gallinacea	2		

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*—Continued

CALIFORNIA—10 SPECIES—continued

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Berkeley	Dwelling	N	4	*Nosopsyllus fasciatus* *Leptopsylla segnis*	15 11	0	26
Oroville	Markets	N	11	*Xenopsylla cheopis* *Nosopsyllus fasciatus*	86 8	177	271
Chico	Garbage dump	N	45	*Xenopsylla cheopis**	62	62	62
Walnut Grove	do	N	24	*Nosopsyllus fasciatus* *Diamanus montanus*	7 1	0	8
Stockton	Markets, office building	N	33	*Xenopsylla cheopis* *Diamanus montanus*	140 1	0	141
Red Bluff	Markets	N	11	*Xenopsylla cheopis*	10	25	35
Colusa	Stores, dairy	N	104	*Xenopsylla cheopis* *Nosopsyllus fasciatus*	15 18	90	123
Williams	Cafe	N	2	*Leptopsylla segnis*	2	0	2
Maxwell	Ranch	N	1	*Nosopsyllus fasciatus*	1	0	1
Willows	Slaughterhouse, packing company, cheese factory.	N	41	*Nosopsyllus fasciatus* *Echidnophaga gallinacea*	2 9	26	37
Orland	Ranch	N	8	*Nosopsyllus fasciatus*	1	1	2
Nicolaus	do	N	16	*Nosopsyllus fasciatus* *Leptopsylla segnis*	4 6	27	37

COLORADO—4 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Fort Collins	Ranch, garbage dump, alley way.	N	44	*Nosopsyllus fasciatus*	107	3	110
Denver	Garbage dump, alley way.	N	703	*Xenopsylla cheopis* *Nosopsyllus fasciatus*	45 20	1,089	1,154
Walsenburg	Ranch	N	4	*Monopsyllus wagneri* *Anomiopsyllus sp*	5* 2*	7	7
Edgewater	Garbage dump	N	35	*Nosopsyllus fasciatus*	5	26	31
Limon	Grain elevators	N	8	*Nosopsyllus fasciatus*	1	14	15
Springfield	Ranch	N	2	None	0	1	1
Fort Morgan	Garbage dump	N	114	do	0	29	29

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*—Continued

IDAHO—3 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Lewiston	Garbage dump, stores, markets, hotel, ranch.	N	241	*Nosopsyllus fasciatus* *Monopsyllus wagneri*	62 1	209	272
St. Maries	Ranch, stores	N	5	*Thrassis petiolatus*	1	0	1

MONTANA—7 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Lewiston	Garbage dump, ranch, refinery.	N	91	*Oropsylla rupestris* *Megabothris abantis* *Megabothris lucifer* *Orchopeas sexdentatus* *Opisocrostis labis*	2 1 1 1 1	0	6
Moore	Grain elevator	N	23	*Oropsylla rupestris* *Monopsyllus wagneri*	1 1	0	2
Acerville	Residence	N	29	*Megabothris lucifer*	1	0	1
Hobson	Grain elevator	N	28	None	0	0	0
Benchland	do	N	15	*Megabothris lucifer*	1	0	1
Sidney	Garbage dump, ranch, cafe.	N	97	*Nosopsyllus fasciatus*	14	69	83
Savage	Ranch, residence	N	36	*Nosopsyllus fasciatus**	4	4	4
Fairview	Ranch	N	2	None	0	0	0

NEBRASKA—2 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Chadron	Slaughterhouse	N	73	*Nosopsyllus fasciatus**	2	2	2
Alliance	Grain elevators	N	120	*Thrassis fotus* *Nosopsyllus fasciatus**	1 4	4	5
Sidney	Garbage dump	N	79	*Nosopsyllus fasciatus**	122	122	122

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*—Continued

NEVADA—1 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Reno	Packing company store, markets.	A	28	*Nosopsyllus fasciatus**	13	13	13
Sparks	Ranch	A	12	*Nosopsyllus fasciatus**	2	2	2

NEW MEXICO—4 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Las Cruces	Ranch, market	A	26	*Echidnophaga gallinacea*	6	4	10
Lordsburg	Restaurant	A	37	*Xenopsylla cheopis*	23	0	26
				Leptopsylla segnis	3		
Albuquerque	Garbage dump, warehouse, packing company.	N	214	*Xenopsylla cheopis*	7	318	359
				Nosopsyllus fasciatus	15		
				Echidnophaga gallinacea	19		
Los Lunas	Ranch, store	N	19	*Nosopsyllus fasciatus*	8	0	8
Chanez	Ranch	N	1	None	0	0	0
Roswell	do	N	17	*Echidnophaga gallinacea*	10	704	714
Clayton	Garbage dump	N	85	None	0	3	3
State Line	Ranch	N	12	*Nosopsyllus fasciatus**	4	4	4

OREGON—6 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Corvallis	Garbage dump	N	16	*Nosopsyllus fasciatus*	3	0	3
Astoria	do	N	17	None	0	0	0
Marshfield	Garbage dump, creamery.	N	38	*Nosopsyllus fasciatus*	17	25	47
				Leptopsylla segnis	5		
Reedsport	Creamery	N	1	None	0	0	0
Roseburg	Garbage dump	N	78	*Nosopsyllus fasciatus*	6	16	26
				Malaraeus telchinum	2		
				Orchopeas sexdentatus	1		
				Diamanus montanus	1		

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*—Continued

OREGON—6 SPECIES—continued

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Eugene	do	N	90	*Nosopsyllus fasciatus* *Diamanus montanus*	3 1	0	4
Newport	Garbage dump, hotel	N R	3 1	*Nosopsyllus fasciatus*	2	2	4
Albany	Packing company, garbage dump.	N	8	None	0	0	0
Salem	Store	N	5	do	0	0	0
Arlington	Ranch	N	2	do	0	0	0
The Dalles	Garbage dump	N	9	*Nosopsyllus fasciatus* *Diamanus montanus*	2 2	6	10
McMinnville	do	N	30	*Ctenocephalides canis*	1	0	1
Olex	Ranch	N	1	None	0	0	0
Hood River	Garbage dump	N	6	None	0	0	0
Lexington	Warehouse	N	8	*Nosopsyllus fasciatus*	7	8	15

TEXAS—3 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Newman	Ranch	A	1	*Nosopsyllus fasciatus** *Echidnophaga gallinacea**	2 1	3	3
El Paso	Store, hotel, warehouses	A	80	*Diamanus montanus*	3	18	21
Amarillo	Grain elevator, dance hall.	N	47	*Nosopsyllus fasciatus**	8	8	8

UTAH—3 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Salt Lake City	Store, dairy, market, garbage dump, stock yards.	A N R	22 242 31	*Xenopsylla cheopis* *Nosopsyllus fasciatus*	475 3	67	545
Provo	Garbage dump	N	53	*Nosopsyllus fasciatus*	10	0	10
Payson	do	N	28	*Nosopsyllus fasciatus*	5	17	22

TABLE 1.—*Species and number of rats and fleas collected west of the 102d meridian, by State, locality, and type of environment in which found*—Continued

WASHINGTON—5 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Everett	Garbage dump	N	180	*Xenopsylla cheopis*	60	43	103
Spokane	Garbage dump, ranch, market.	N	36	*Nosopsylla fasciatus* *Monopsyllus wagneri*	25 1	22	48
Cheney	Garbage dump, ranch, slaughterhouse.	N	34	*Nosopsyllus fasciatus*	4	80	84
Spangle	Garbage dump, residence	N	12	*Nosopsyllus fasciatus*	11	16	27
Plaza	Grain elevators	N	6	*Nosopsyllus fasciatus*	5	67	72
Seattle	King Street	N	1	*Xenopsylla cheopis* *Leptopsylla segnis* *Ctenocephalides felis*	16 6 2	0	24
Medical Lake	Garbage dump	N	229	*Nosopsyllus fasciatus**	305	305	305
Marshall	Ranch	N	[illegible]	None	0	7	7

WYOMING—2 SPECIES

Location	Environment	Host		Fleas			
		Species	Number	Classification	Number classified	Number inoculated	Total
Sheridan	Garbage dump	N	15	None	0	0	0
Fort McKenzie	do	N	76	*Nosopsyllus fasciatus* *Thrassis howelli*	1 1	0	2
Cheyenne	do	N	19	None	0	7	7

A = *Rattus rattus alexandrinus.*
N = *Rattus norvegicus.*
R = *Rattus rattus rattus.*

*Fleas classified in salt solution before their inoculation into animals for the detection of plague.

All three species of rats represented are highly susceptible to infection with plague under natural conditions. Transmission of plague in septicemic form to man occurs when a flea feeds upon an infected rat during the septicemic stage of the disease, and subsequently bites the human being within the period during which the flea is capable of transmitting the infection.

On the basis of the data in table 1, it would seem that *R. norvegicus* is the most prevalent species. This species was found in 12 of the States surveyed and in greater number than the other species. Nevertheless, *R. rattus* and *R. alexandrinus* were taken in several localities. The procedure followed in the surveys may have resulted in fewer rats of these species being taken; complete surveys were not made of buildings or other harborages since the purpose of the study was to

obtain a sample of the local rat population in order to determine if it was infected with plague.

X. cheopis is regarded thoughout the world as the most efficient vector of plague from rat to rat. It has readily attacked man and various species of rodents under experimental conditions. This flea was found in the interior of 5 of the States surveyed and in the coastal cities of 2 States. In view of its extensive distribution and its adaptability to a variety of hosts *X. cheopis* must be recognized as an important factor in considering the possibility of widespread dissemination of plague. Another species, *N. fasciatus*, has not received so much attention as *X. cheopis*. Nevertheless, it too is an efficient vector of plague. It was found to be even more widely distributed than *X. cheopis*, occurring in 12 of the 13 States surveyed.

Under experimental conditions, single fleas of each of these species have been observed to infect three or four animals in one day (*2*). Single specimens of some species of field rodent fleas also have been observed to infect more than one animal bitten under experimental conditions. Probably these fleas are also efficient vectors under natural conditions.

It should be borne in mind that the number of fleas collected from animals is not a reliable index of the number present in or around burrows and other places frequented by rodents.

Nine of the species of fleas collected, including the two common rat fleas, *X. cheopis* and *N. fasciatus*, have been found capable of transmitting plague under experimental conditions by biting hosts on which they do not occur in nature (*2, 3*). Five other species, including a third flea common to rats (*Leptopsylla segnis*), did not transmit the infection under the conditions of the test although they were proved to be infected (*2*). A specimen of one species, *Echidnophaga gallinacea*, is reported to have been infected at the time it was taken from a burrowing owl (*4*). The infectibility or infectiousness of the remaining six species has not been reported.

Plague was not found in the rats collected during the surveys here considered. Nevertheless, plague has been demonstrated in wild rodents, or in fleas from wild rodents, taken in 11 of the 13 States covered by this study. The presence of infected wild rodents and of ectoparasitic vectors which adapt themselves to various hosts affords an opportunity for the transmission of plague to rats. It has been shown that city rats migrate as far as 4 miles within a period of 2 weeks (*5*). Therefore, contact between urban rats and rodents of the fields and woods is feasible.

It should be noted that isolated specimens of plague-infected *R. norvegicus* were discovered in 1941 in the San Francisco Bay region of California. This was the first year since 1908 that an infected rat had been discovered in San Francisco, in spite of the fact that thou-

sands of rats were examined each year. Animal inoculation tests have also demonstrated plague recently in several collections of fleas taken from rats in this region. Similar tests disclosed plague in fleas collected from rats taken in Tacoma, Wash., in October 1942, and since that date infected fleas and rat tissues have been detected with increasing frequency. These facts may indicate that ectoparasitic vectors are finding their way from infected wild rodents to rats in or near centers of population in these coastal areas.

Surveys conducted by the United States Public Health Service and State health departments have demonstrated the existence of plague among wild rodents in 12 States. There is also evidence to indicate that in recent years there has been an increase in the rat population of some urban centers in these States as well as in the cities of the Great Plains region and Mississippi Valley. Should the infection spread from the wild rodents to the urban rats, it is possible that serious outbreaks of human pneumonic plague might occur. Therefore it is apparent that the existence of plague among wild rodents should be a matter of concern to health authorities and physicians in a large part of the United States.

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DEATHS DURING WEEK ENDED APRIL 17, 1943

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

	Week ended Apr. 17, 1943	Corresponding week, 1942
Data for 87 large cities of the United States:		
Total deaths	9,602	8,669
Average for 3 prior years	8,691	
Total deaths, first 15 weeks of year	147,923	135,235
Deaths under 1 year of age	604	602
Average for 3 prior years	533	
Deaths under 1 year of age, first 15 weeks of year	10,263	8,437
Data from industrial insurance companies:		
Policies in force	66,503,260	64,975,859
Number of death claims	12,628	13,038
Death claims per 1,000 policies in force, annual rate	9.9	10.5
Death claims per 1,000 policies, first 15 weeks of year, annual rate	10.7	10.2

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

REPORTS FROM STATES FOR WEEK ENDED APRIL 24, 1943

Summary

Decreases from the preceding week's totals are shown in the current weekly reports of all of the nine common communicable diseases included in the following tables except poliomyelitis, smallpox, and typhoid fever. Both current and cumulative figures (first 16 weeks) for smallpox and typhoid fever, however, remain below the corresponding 5-year (1938–42) medians.

Meningococcus meningitis cases reported for the week totaled 549, as compared with 605 for the preceding week and a 5-year median of 55. The cumulative figure for the first 16 weeks of the year is 7,601, as compared with a 5-year median of 814 and with 4,292 for the same period of 1929, the latter being the largest number reported during the comparable period of any of the past 16 years. During the current week, decreases occurred in all but three of the nine geographic sections of the country, both as compared with the preceding week's totals and with the averages for the preceding 3 weeks. In the East North Central group, where the 3-week average was 62, there was an increase during the current week from 68 to 86 cases. In the East South Central group the weekly increase was from 44 to 62, the latter figure being also the 3-week average. In the Mountain States the current week's total was 25, as compared with 18 for the preceding week and also for the average. States reporting the largest numbers for the current week (preceding week's figures in parentheses) were as follows: New York, 76 (69); California, 48 (38); Michigan, 38 (17); Pennsylvania, 29 (43); Massachusetts, 27 (40); Kentucky, 26 (14); Virginia, 24 (27); New Jersey, 23 (23); Illinois, 22 (13); and Maryland, 20 (16).

Currently, 23 cases of smallpox were reported in Ohio, some of which, however, may be delayed reports. For the 13-day period ended April 24, 27 cases were reported in that State, 25 of which occurred in Jefferson County, principally in the Steubenville area. For the current week 6 cases of smallpox were reported in five other States, making a total of 29 cases for the country as a whole.

The total number of deaths recorded for the current week in 90 large cities of the United States was 9,338, as compared with 9,795 for the preceding week and a 3-year (1940–42) average of 8,418. The cumulative total for the first 16 weeks of the year is 160,113, as compared with 146,156 for the same period in 1942.

Telegraphic morbidity reports from State health officers for the week ended April 24, 1943, and comparison with corresponding week of 1942 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942	
NEW ENG.												
Maine	2	1	2	----	----	1	2	185	185	10	3	0
New Hampshire	0	0	0	1	2	----	23	8	30	1	0	0
Vermont	0	0	0	----	----	----	347	125	73	1	0	0
Massachusetts	1	2	2	----	----	----	1,524	1,187	746	27	7	1
Rhode Island	2	1	0	1	----	----	24	298	49	14	0	0
Connecticut	0	2	1	2	----	4	447	590	276	11	2	0
MID. ATL.												
New York	18	20	19	[1] 30	[1] 6	[1] 15	3,066	645	1,782	76	13	5
New Jersey	2	5	11	[1]	5	5	1,545	663	663	23	5	1
Pennsylvania	11	6	14	1	----	----	1,765	1,419	1,419	29	7	7
E. NO. CEN.												
Ohio	9	6	7	20	10	10	1,084	342	342	6	0	2
Indiana	6	5	9	21	7	11	572	171	171	14	0	0
Illinois	19	11	21	9	6	21	1,414	601	601	22	1	1
Michigan [2]	2	6	6	61	1	2	2,878	426	671	38	6	3
Wisconsin	1	1	0	24	60	62	1,620	1,020	1,020	6	1	1
W. NO. CEN.												
Minnesota	0	2	2	1	1	2	285	980	292	3	0	0
Iowa	6	2	3	6	5	8	336	315	228	1	0	0
Missouri	0	4	5	4	----	5	415	560	386	14	2	1
North Dakota	1	2	1	----	74	6	[3] 70	71	32	0	0	0
South Dakota	0	5	1	----	----	----	68	13	7	0	0	0
Nebraska	0	3	2	----	14	5	198	400	154	3	0	0
Kansas	3	2	3	11	3	8	576	720	720	[3] 6	0	0
SO. ATL.												
Delaware	0	0	0	----	----	----	331	4	5	1	0	0
Maryland [2]	1	6	2	3	6	6	107	790	378	20	4	2
Dist. of Col.	1	1	1	3	2	2	78	112	112	2	2	1
Virginia	3	4	9	284	217	224	425	247	457	24	3	2
West Virginia	1	4	3	11	42	42	176	246	246	2	2	2
North Carolina	7	8	14	6	34	8	191	864	864	15	0	2
South Carolina	3	2	4	385	265	416	372	143	143	11	0	1
Georgia	7	6	6	63	47	55	238	201	201	2	2	0
Florida	6	2	2	9	1	7	82	171	232	8	0	0
E. SO. CEN.												
Kentucky	4	2	6	16	6	9	334	67	77	26	2	2
Tennessee	3	3	3	86	16	69	381	121	154	15	1	2
Alabama	0	4	5	114	172	148	288	143	143	15	8	4
Mississippi [2]	7	8	4	----	----	----	----	----	----	6	1	1
W. SO. CEN.												
Arkansas	4	4	5	19	79	95	131	183	183	0	0	0
Louisiana	2	0	5	2	2	9	197	184	70	9	1	1
Oklahoma	6	3	4	43	45	156	43	306	123	1	0	0
Texas	17	30	22	868	554	554	611	1,974	1,140	3	0	1
MOUNTAIN												
Montana	2	1	0	2	4	4	251	158	32	1	0	0
Idaho	10	0	0	3	----	1	87	134	54	6	0	0
Wyoming	0	1	0	23	141	----	153	54	54	3	0	0
Colorado	5	7	10	26	39	18	738	310	352	5	1	0
New Mexico	0	7	2	5	1	1	16	99	70	1	0	0
Arizona	0	2	2	68	80	84	64	145	104	4	0	0
Utah [2]	1	0	0	2	11	10	228	441	265	5	0	0
Nevada	0	0	----	----	----	----	0	273	----	0	0	----
PACIFIC												
Washington	3	1	1	2	4	----	393	377	377	5	3	0
Oregon	2	0	2	17	17	17	346	165	165	6	0	0
California	20	9	16	78	164	69	842	6,674	685	48	2	2
Total	198	201	238	2,339	2,143	2,243	25,362	24,725	24,725	549	79	55
16 weeks	4,340	4,687	5,723	66,304	69,295	134,670	[3] 288,308	[3] 79,676	279,676	[3] 7,601	1,231	814

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 24, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942		Apr. 24, 1943	Apr. 25, 1942	
NEW ENG.												
Maine	0	0	0	8	29	23	0	0	0	0	1	0
New Hampshire	0	0	0	13	10	7	0	0	0	2	0	0
Vermont	0	0	0	12	6	7	0	0	0	0	0	0
Massachusetts	2	0	0	588	391	181	0	0	0	5	0	0
Rhode Island	0	0	0	25	10	17	0	0	0	0	0	0
Connecticut	0	0	0	139	29	94	0	0	0	1	0	1
MID. ATL.												
New York	1	3	0	643	464	531	0	0	0	5	7	2
New Jersey	0	0	0	148	137	156	0	0	0	2	0	3
Pennsylvania	0	0	0	321	540	401	0	0	0	8	8	8
E. NO. CEN.												
Ohio	0	0	1	228	281	258	23	0	0	4	6	3
Indiana	0	2	0	89	102	154	0	1	1	0	2	1
Illinois	0	0	0	166	204	458	0	0	2	1	6	4
Michigan [2]	0	0	0	133	288	326	0	0	6	5	3	2
Wisconsin	0	0	0	380	162	162	0	0	6	0	0	0
W. NO. CEN.												
Minnesota	0	0	0	63	50	80	0	0	3	0	1	0
Iowa	0	0	0	53	35	54	0	0	38	2	0	0
Missouri	1	0	0	116	91	86	0	9	9	2	6	2
North Dakota	0	0	0	3	18	11	0	0	2	0	0	0
South Dakota	0	0	0	14	26	19	0	0	4	1	0	0
Nebraska	0	0	0	36	28	16	0	0	0	0	0	0
Kansas	0	0	1	49	96	96	1	0	1	1	0	1
SO. ATL.												
Delaware	0	0	0	4	45	15	0	0	0	0	0	0
Maryland [2]	0	0	0	74	80	50	0	0	0	2	1	1
Dist. of Col.	0	0	0	20	13	15	0	0	0	0	0	0
Virginia	0	0	0	39	12	31	0	0	0	4	1	1
West Virginia	2	0	0	23	31	31	0	0	0	8	2	2
North Carolina	0	0	0	38	2	20	0	0	0	1	1	1
South Carolina	0	2	2	4	3	4	0	0	0	1	0	0
Georgia	0	1	0	11	10	10	0	1	0	1	10	4
Florida	0	1	1	7	4	5	0	0	0	3	9	4
E. SO. CEN.												
Kentucky	1	1	1	47	71	71	0	0	0	0	0	3
Tennessee	1	0	0	58	50	51	0	1	0	0	4	2
Alabama	0	0	0	13	9	9	0	0	0	0	2	2
Mississippi [2]	1	1	1	9	12	3	0	1	1	4	2	2
W. SO. CEN.												
Arkansas	1	0	0	4	4	5	1	1	1	1	0	5
Louisiana	0	0	0	6	8	8	0	0	0	4	6	6
Oklahoma	1	0	1	19	7	16	0	0	1	2	1	1
Texas	3	4	2	46	36	36	1	3	6	5	6	7
MOUNTAIN												
Montana	0	0	0	6	17	22	0	0	0	0	0	0
Idaho	0	0	0	28	1	4	0	0	0	0	0	0
Wyoming	0	0	0	70	9	7	0	0	0	0	0	0
Colorado	0	0	0	52	22	36	0	0	4	1	0	0
New Mexico	0	0	0	9	5	11	0	0	0	0	1	1
Arizona	3	0	0	10	2	5	0	0	0	0	0	0
Utah [2]	1	0	0	30	16	16	0	0	0	1	0	0
Nevada	0	0	------	0	6	------	0	0	------	0	0	------
PACIFIC												
Washington	0	0	0	35	23	35	1	0	0	0	1	1
Oregon	0	0	0	24	9	11	2	2	8	0	0	0
California	5	1	1	118	102	141	0	0	3	3	3	6
Total	23	16	16	4,031	3,606	4,180	29	19	86	80	90	90
16 weeks	401	343	343	63,798	63,030	76,587	424	362	1,161	882	1,216	1,255

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 24, 1943, and comparison with corresponding week of 1942—Continued

Division and State	Whooping cough			Week ended Apr. 24, 1943								
	Week ended		Median 1938–42	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Apr. 24, 1943	Apr. 25, 1942			Amebic	Bacillary	Unspecified					
NEW ENG.												
Maine	25	18	33	0	0	0	0	0	0	0	0	0
New Hampshire	11	6	5	0	0	0	0	0	0	0	0	0
Vermont	11	40	25	0	0	0	0	0	0	0	0	0
Massachusetts	114	206	151	0	0	0	0	0	0	0	0	0
Rhode Island	34	16	10	0	0	0	0	0	0	0	0	0
Connecticut	29	74	57	0	0	0	0	2	0	0	0	0
MID ATL.												
New York	253	441	389	0	4	14	0	0	0	0	0	0
New Jersey	117	299	202	0	0	0	0	0	1	0	0	0
Pennsylvania	231	282	273	0	0	1	0	1	0	0	0	0
E. NO. CEN.												
Ohio	99	148	148	0	0	0	0	1	0	0	0	0
Indiana	93	55	45	0	0	0	0	0	0	0	0	0
Illinois	104	229	136	0	0	0	0	0	0	0	0	0
Michigan [2]	319	215	215	0	1	2	0	0	0	0	0	0
Wisconsin	213	227	154	0	0	0	0	0	0	0	0	0
W. NO. CEN.												
Minnesota	58	40	40	0	4	1	0	0	0	0	0	0
Iowa	48	37	25	0	0	0	0	0	0	0	0	0
Missouri	26	11	18	0	0	0	0	0	0	0	0	0
North Dakota	6	17	17	0	0	0	0	0	0	0	0	0
South Dakota	4	6	6	0	0	0	0	0	0	1	0	0
Nebraska	6	2	10	0	0	0	0	0	0	0	0	0
Kansas	97	33	33	0	0	0	0	2	0	0	0	0
SO. ATL.												
Delaware	1	1	10	0	0	0	0	0	0	0	0	0
Maryland [3]	91	63	63	0	0	0	0	0	0	0	0	0
Dist. of Col.	17	13	13	0	0	0	0	0	0	0	0	0
Virginia	76	84	84	0	0	0	19	0	0	0	0	0
West Virginia	75	12	38	0	0	0	0	0	0	0	0	0
North Carolina	162	117	216	0	0	0	0	0	0	1	0	2
South Carolina	44	63	63	0	0	0	0	0	0	0	0	1
Georgia	126	13	29	0	2	1	0	0	0	0	3	9
Florida	13	14	19	0	0	2	0	0	0	0	0	3
E. SO. CEN.												
Kentucky	[3] 36	89	80	0	0	0	0	0	0	0	0	0
Tennessee	59	29	33	0	0	0	0	0	0	0	0	0
Alabama	88	35	33	0	0	0	0	0	0	0	0	7
Mississippi [3]	------	------	------	0	0	0	0	0	0	0	3	0
W. SO. CEN.												
Arkansas	28	7	11	0	1	1	0	0	0	0	3	0
Louisiana	5	4	10	0	1	0	0	0	0	0	0	1
Oklahoma	20	12	22	0	0	0	0	0	0	0	0	0
Texas	701	126	229	0	16	140	0	3	0	0	1	16
MOUNTAIN												
Montana	18	20	6	0	0	0	0	0	0	2	1	0
Idaho	3	3	5	0	0	0	0	0	0	1	0	0
Wyoming	13	27	4	0	0	0	0	0	0	2	0	0
Colorado	34	18	46	0	0	4	0	0	0	0	0	0
New Mexico	19	39	21	0	0	0	0	0	0	0	0	0
Arizona	13	21	26	0	1	0	40	0	0	0	0	0
Utah [3]	81	30	73	0	0	0	0	0	0	0	0	0
Nevada	0	4	------	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	22	105	105	0	0	0	0	0	0	0	0	0
Oregon	13	44	30	0	0	0	0	0	0	1	0	0
California	319	354	418	0	1	10	0	1	0	0	0	2
Total	3,975	3,749	3,749	0	31	176	59	10	1	8	11	41
16 weeks	[4]64,183	61,495	65,233	23	472	3,119	729	176	8	17	269	756

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed reports for the week ended April 17 include 1 case of meningococcus meningitis in Kansas, 94 cases of measles in North Dakota, and 42 cases of whooping cough in Kentucky.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 10, 1943

This table lists the reports from 86 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.

	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 ENG.												
Maine:												
Portland	0	0	------	0	3	7	1	0	3	0	0	17
New Hampshire:												
Concord	0	0	------	0	2	0	0	0	0	0	0	0
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	0	0	------	1	198	15	25	0	200	0	0	33
Fall River	0	0	------	0	78	3	0	0	10	0	0	17
Springfield	0	0	------	0	5	1	1	0	83	0	0	0
Worcester	0	0	------	0	366	1	4	0	15	0	0	11
Rhode Island:												
Providence	0	0	1	0	2	9	5	0	12	0	0	39
Connecticut:												
Bridgeport	0	0	------	0	1	1	2	0	4	0	0	0
Hartford	0	0	------	0	56	1	9	0	3	0	0	2
New Haven	0	0	------	0	7	0	2	0	3	0	0	3
MID. ATL.												
New York:												
Buffalo	0	0	------	1	112	5	11	0	13	0	1	12
New York	19	2	13	5	789	32	98	0	378	0	2	66
Rochester	0	0	------	0	80	2	4	0	10	0	0	35
Syracuse	0	0	------	0	105	1	5	0	6	0	1	12
New Jersey:												
Camden	0	0	2	0	20	1	3	0	1	0	0	12
Newark	0	0	10	1	257	6	7	0	12	0	0	16
Trenton	1	0	------	0	135	0	3	0	14	0	0	0
Pennsylvania:												
Philadelphia	6	0	2	0	404	19	30	0	114	0	0	70
Pittsburgh	2	0	4	2	45	3	13	0	11	0	1	36
Reading	0	0	------	1	166	0	2	0	6	0	0	6
E. NO. CEN.												
Ohio:												
Cincinnati	0	0	------	0	148	5	0	0	40	0	0	3
Cleveland	2	1	4	3	19	3	7	0	51	0	0	57
Columbus	0	0	2	2	25	1	5	0	20	0	0	0
Indiana:												
Fort Wayne	0	0	------	0	2	0	2	0	13	0	0	0
Indianapolis	1	0	------	1	144	2	11	0	21	0	0	14
South Bend	0	0	------	0	1	0	3	0	0	0	0	0
Terre Haute	0	0	------	0	7	0	1	0	0	1	0	0
Illinois:												
Chicago	14	2	2	2	775	4	19	0	83	0	0	50
Springfield	0	0	------	0	7	0	2	0	2	0	0	0
Michigan:												
Detroit	4	0	1	0	873	11	22	0	42	0	2	114
Flint	0	0	------	0	22	0	7	0	1	0	0	4
Grand Rapids	0	0	------	1	5	0	3	0	2	0	0	14
Wisconsin:												
Kenosha	0	0	------	0	0	0	0	0	6	0	0	1
Milwaukee	0	0	------	0	388	2	1	0	178	0	0	37
Racine	0	0	------	0	11	0	0	0	19	0	0	1
Superior	0	0	------	0	3	0	0	0	1	0	0	2
W. NO. CEN.												
Minnesota:												
Duluth	0	0	------	0	1	0	0	0	9	0	0	4
Minneapolis	1	0	------	0	61	1	2	0	30	0	0	20
St. Paul	0	0	------	0	21	0	5	0	3	0	0	55
Missouri:												
Kansas City	0	0	------	0	152	4	4	0	43	0	0	6
St. Louis	0	0	3	2	48	16	13	0	24	0	0	19
North Dakota:												
Fargo	0	0	------	0	5	0	0	0	1	0	0	0
Nebraska:												
Omaha	0	0	------	1	8	0	3	0	7	0	0	4
Kansas:												
Topeka	0	0	------	0	266	1	1	0	1	0	0	7
Wichita	0	0	------	0	137	1	3	0	0	0	0	7

City reports for week ended April 10, 1943—Continued

	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								
SO. ATL.												
Delaware:												
Wilmington	0	0	------	0	17	1	2	0	2	0	1	0
Maryland:												
Baltimore	1	0	2	1	48	12	17	0	76	0	1	100
Cumberland	0	0	------	0	0	0	0	0	1	0	0	0
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
Dist. of Col.:												
Washington	0	0	------	0	57	7	13	0	26	0	0	26
Virginia:												
Lynchburg	0	0	------	0	3	0	1	0	2	0	0	8
Richmond	0	0	------	2	8	2	6	0	5	0	0	1
Roanoke	0	0	------	0	2	0	0	0	0	0	0	0
West Virginia:												
Charleston	0	0	2	0	0	0	0	0	1	0	0	0
Wheeling	0	0	------	0	1	0	0	0	0	0	0	1
North Carolina:												
Winston-Salem	0	0	1	0	4	0	2	0	0	0	0	15
South Carolina:												
Charleston	0	0	2	0	0	0	1	0	0	0	0	6
Georgia:												
Atlanta	0	0	10	0	8	0	2	1	6	0	0	8
Brunswick	0	0	------	0	3	0	0	0	0	0	0	0
Savannah	0	0	2	1	2	0	4	0	0	0	0	0
Florida:												
Tampa	0	0	------	0	3	0	2	0	1	0	0	1
E. SO. CEN.												
Tennessee:												
Memphis	0	0	1	0	139	0	4	0	4	0	0	15
Nashville	0	0	------	2	41	0	2	0	1	0	0	5
Alabama:												
Birmingham	0	0	7	2	2	0	5	0	1	0	0	1
Mobile	0	0	------	1	0	1	5	1	0	0	0	0
W. SO. CEN.												
Arkansas:												
Little Rock	0	0	------	0	7	0	2	0	1	0	0	6
Louisiana:												
New Orleans	2	0	11	2	43	2	7	0	4	0	2	11
Shreveport	0	0	------	0	0	0	4	0	1	0	1	0
Texas:												
Dallas	2	0	1	1	4	1	3	0	1	0	0	15
Galveston	0	0	------	0	5	0	2	0	0	0	0	1
Houston	3	0	------	2	14	0	5	0	3	0	1	11
San Antonio	2	0	1	0	4	0	7	0	0	0	0	0
MOUNTAIN												
Montana:												
Billings	0	0	------	0	1	0	0	0	0	0	0	1
Great Falls	0	0	------	0	24	0	0	0	0	0	0	0
Helena	0	0	------	0	77	0	1	0	3	0	0	0
Missoula	0	0	------	0	6	0	0	0	1	0	0	0
Idaho:												
Boise	0	0	------	0	13	0	0	0	0	0	0	0
Colorado:												
Denver	8	0	19	1	726	0	3	0	4	0	0	5
Pueblo	0	0	------	0	5	0	0	0	1	0	0	9
Utah:												
Salt Lake City	1	0	------	0	111	2	2	0	7	0	0	22
PACIFIC												
Washington:												
Seattle	0	0	------	1	157	0	14	0	3	0	0	8
Spokane	0	0	------	0	126	0	3	0	1	0	0	1
California:												
Los Angeles	1	0	16	2	120	5	6	0	33	0	0	36
Sacramento	0	0	1	1	0	2	1	0	2	0	0	5
San Francisco	1	0	1	1	95	3	15	0	24	0	0	32
Total	71	5	121	43	7,836	196	480	2	1,710	1	13	1,150
Corresponding week, 1942	55	2	145	23	5,958	43	424	3	1,342	1	24	1,063
Average, 1938–42	79	------	254	[1] 44	[2] 5,744	------	[1] 466	------	1,656	14	18	1,095

[1] 3-year average, 1940–42.
[2] 5-year median

Dysentery, amebic.—Cases: New York, 4; Los Angeles, 2.
Dysentery, bacillary.—Cases: Bridgeport, 1; Buffalo, 4; New York, 5; Richmond, 1; Los Angeles, 6.
Tularemia.—Cases: Atlanta, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1942, 84,502,400)

	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 ENG.	0.0	0.0	2.5	2.5	1,784	94.4	122.0	0.0	827	0.0	0.0	303
MID. ATL.	12.5	0.9	13.8	4.5	942	30.8	78.5	0.0	252	0.0	2.2	118
E. NO. CEN.	12.3	1.8	5.3	5.3	1,419	16.4	48.5	0.0	280	0.6	1.2	173
W. NO. CEN.	2.0	0.0	6.0	6.0	1,401	46.1	62.1	0.0	237	0.0	0.0	245
SO. ATL.	1.7	0.0	33.0	6.9	271	38.2	86.8	1.7	208	0.0	3.5	288
E. SO. CEN.	0.0	0.0	47.5	29.7	1,081	5.9	95.0	5.9	36	0.0	0.0	125
W. SO. CEN.	26.4	0.0	38.1	14.7	226	8.8	88.0	0.0	29	0.0	11.7	111
MOUNTAIN	72.4	0.0	153.0	8.0	7,742	16.1	48.2	0.0	129	0.0	0.0	297
PACIFIC	3.6	0.0	32.7	9.1	904	18.2	70.8	0.0	114	0.0	0.0	149
TOTAL	10.7	0.8	18.3	6.5	1,184	29.6	72.5	0.3	258	0.2	2.0	174

PLAGUE INFECTION IN CALIFORNIA AND WASHINGTON

Plague infection has been reported proved in pools of fleas from rodents collected in California and Washington as follows:

CALIFORNIA

San Diego County: March 15, in a pool of 114 fleas from 27 ground squirrels (*C. fisheri*) taken about 2 miles southwest of Bonsell; March 18, in a pool of 161 fleas from 52 ground squirrels (*C. beecheyi nudipes*) taken on a ranch 1 mile south and 2 miles east of Delmar, Calif.

Monterey County: March 30 and 31, in a pool of 12 fleas from 32 harvest mice (*Reithrodontomys*) taken at Camp Hunter Liggett, Jolon, Calif.

WASHINGTON

Pierce County—Tacoma: March 31, in a pool of 45 fleas from 54 rats (*R. norvegicus*) from frame buildings in an industrial district; April 9, in a pool of 27 fleas from 4 rats from frame buildings in a residential section of Tacoma, Wash.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 27, 1943.—During the week ended March 27, 1943, 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		15		123	169	28	11	19	56	421
Diphtheria	1	18	1	12	1	8		1		42
Dysentery (bacillary)				16						16
German measles		5		38	34	1		11	11	100
Influenza		16			37	22	2		204	281
Measles		58	2	215	431	84	241	92	139	1,262
Meningitis, meningococcus		4	1	3	6		2	1	3	20
Mumps	2	191		107	1,043	109	119	91	207	1,869
Poliomyelitis						1				1
Scarlet fever		15	10	131	248	31	34	52	29	550
Tuberculosis (all forms)	2	3	5	121	43	24		31	22	251
Typhoid and paratyphoid fever			1	32		1		1		35
Whooping cough		2		65	130	81	8	24	52	362

CUBA

Provinces—Notifiable diseases—4 weeks ended February 27, 1943.—During the 4 weeks ended February 27, 1943, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1	1	5	21		8	36
Chickenpox					1	31	32
Diphtheria	1	31	5	1	1	4	43
Hookworm disease		16					16
Leprosy			1		1	3	5
Malaria	20	7		18	2	219	266
Measles		9		3	1		13
Poliomyelitis	1	1	1	2	6		11
Scarlet fever		1					1
Tuberculosis	22	31	17	53	17	51	191
Typhoid fever	5	65	14	22	10	28	144
Whooping cough	1					1	2

[1] Includes the city of Habana.

GERMANY

Infectious diseases—Year 1942—Comparative.—Cases of certain infectious diseases have been reported in Germany for the year 1942 as compared with the year 1941, as follows: [1]

Disease	1942	1941	Disease	1942	1941
Anthrax	33	52	Psittacosis	6	17
B. welchii infection	106	90	Ptomaine poisoning	1,940	2,255
Cerebrospinal meningitis	2,754	4,766	Scarlet fever	401,011	279,117
Diphtheria	289,863	204,918	Tuberculosis:		
Dysentery, infectious	15,148	10,330	Of the lungs and larynx	126,965	117,558
Inflammation of the brain	426	658	Of the skin	1,837	1,909
Malaria	716	1,613	Of other organs	16,996	15,512
Paratyphoid fever	6,076	4,883	Typhoid fever	16,291	7,723
Poliomyelitis	3,929	3,306	Whooping cough	87,960	107,543

[1] Although not stated in the report, it is assumed that the figures are for the old German Reich.

IRAQ

Cerebrospinal meningitis.—Cerebrospinal meningitis has been reported in Iraq as follows: Week ended February 27, 1943, 17 cases, 3 deaths; week ended March 6, 1943, 32 cases, 3 deaths.

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

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

CHOLERA

[C indicates cases]

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

Place		January–December 1942	January–February 1943	March 1943—week ended—			
				6	13	20	27
ASIA							
Ceylon	C	103	35	1	9		
China:							
Kunming (Yunnanfu)	C	[1] 804					
Shanghai	C	869					
India	C	172,172	52,558				
Calcutta	C	2,331	293		37		
Chittagong	C	55					
Madras	C	84	936	3	7		
Rangoon	C	1					
Vizagapatam	C	13	4				
India (French)	C	14					
Pondichery	C	1					

[1] For the period May 12 to July 4, 1942.

PLAGUE

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

AFRICA							
Basutoland	C	10					
Belgian Congo	C	4					
British East Africa:							
Kenya	C	731	9				
Nairobi	C	69					
Uganda	C	346					
Egypt: Port Said	C	3					
Madagascar	C	117	17				
Morocco	C	362	4				
Rhodesia (Northern)	C	16					
Senegal	C	[1] 6					
Union of South Africa	C	104	46				
ASIA							
China.[2]							
India	C	1,286	169	24	24		
Indochina (French)	C	81					
Palestine:							
Haifa	C	5					
Jaffa	C	[3] 7	[3] 7	[3] 1			
EUROPE							
Portugal: Azores Islands	C	1					

[1] Includes 4 suspected cases.

[2] Plague has been reported in China as follows: Chekiang Province, Apr. 1–10, 1942, 4 cases; Fukien Province, Jan. 1–Apr. 5, 1942, plague appeared in 11 localities; Hunan Province, week ended Apr. 18, 1942, 2 cases; Suiyuan Province, pneumonic plague appeared in epidemic form during the period Jan. 1–Apr. 4, 1942, in the northwestern area.

[3] At Jaffa and vicinity.

PLAGUE—Continued

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

Place		January-December 1942	January-February 1943	March 1943—week ended— 6	13	20	27
NORTH AMERICA							
Canada: Alberta Province—							
Plague-infected fleas		P					
SOUTH AMERICA							
Argentina: Cordoba Province	C	28					
Brazil:							
Alagoas State	C	3					
Pernambuco State	C	6					
Chile: Valparaiso	C	1					
Ecuador:							
Chimborazo Province	D	1					
Loja Province	C	4					
Peru:							
Ancash Department	C	8					
Lambayeque Department	C	3	2				
Libertad Department	C	9	6				
Salaverry—Plague-infected rats		P					
Lima Department	C	57	3				
Lima	C	18	1				
Piura Department	C	21					
OCEANIA							
Hawaii Territory:							
Hamakua District [4]	D			1			
Plague-infected rats		122	26			15	5
New Caledonia	C	[5] 2					

[4] Plague (human) has also been reported in Hamakua District as follows: Week ended Apr. 3, 1 death; week ended Apr. 17, 1 death at Honokaa.

[5] Includes 1 case of pneumonic plague.

SMALLPOX

[C indicates cases]

AFRICA							
Algeria	C	814	150		49	38	
Angola	C	268	482				
Basutoland	C	130					
Belgian Congo	C	1,132	303	24	45	42	
British East Africa: Tanganyika	C	84		10			
Dahomey	C	56	20				
Egypt	C		8		3		
French Equatorial Africa	C	2					
French Guinea	C	138	6				
Gold Coast	C	1,423	2				
Ivory Coast	C	71	90				
Morocco	C	1,558	266				
Nigeria	C	2,533	959	178	169		
Niger Territory	C	986	23				
Portuguese East Africa	C	51					
Rhodesia:							
Northern	C	9					
Southern	C	1					
Senegal	C	17	14				
Sierra Leone	C	1					
Sudan (French)	C	296	237				
Tunisia	C	1					
Union of South Africa	C	1,462					
Zanzibar	C	[1] 2					
ASIA							
Ceylon	C	7					
China	C	9					
India	C	30,228	2,855	660	843		
Indochina (French)	C	3,729	718				
Iran	C	194	34				
Iraq	C	344	117	7	11	19	2
Palestine	C	10	28				
Syria and Lebanon	C	1,983	418	26			
Trans-Jordan	C	3					

[1] Imported.

SMALLPOX—Continued

[C indicates cases]

Place		January - December 1942	January - February 1943	March 1943—week ended— 6	13	20	27
EUROPE							
France:							
Seine Department	C	44					
Unoccupied zone	C	13					
Great Britain:							
England and Wales	C	6					
Scotland	C	99	1				
Ireland (Northern)	C	1					
Irish Free State	C	12					
Portugal	C	56	10		2		
Spain	C	211	63				
Turkey	C	1,841	2,455				
NORTH AMERICA							
Canada	C	5	1				
Guatemala	C	7	2				
Mexico	C	134	8				
Panama Canal Zone	C	[2] 1					
SOUTH AMERICA							
Argentina	C	169					
Brazil	C	3	37				
Colombia	C	615	14				
Ecuador	C	6	9	1			
Peru	C	1,152					
Venezuela (alastrim)	C	159	6				

[2] In the Canal Zone.

TYPHUS FEVER

[C indicates cases]

AFRICA							
Algeria	C	35,205	1,112		373	679	
Basutoland	C	36					
Belgian Congo	C		1				
British East Africa: Kenya	C	23	2				
Egypt	C	32,288	5,705	981	1,072		
Gold Coast	C		3				
Ivory Coast	C	4					
Morocco	C	25,846	2,957				
Nigeria	C	5		1			
Niger Territory	C	1					
Rhodesia (Northern)	C	1					
Senegal	C	[1] 3					
Sierra Leone	C	7					
Tunisia	C	16,295					
Union of South Africa	C	1,952	45				
ASIA							
Afghanistan	C	[2] 2,439	520				
China	C	369	6				
India	C	10	12				
Indochina	C	11					
Iran	C	907	111				
Iraq	C	105	83	29	1	2	10
Palestine	C	206	18	8	4		
Syria and Lebanon	C	27	3	1			
Trans-Jordan	C	8					
EUROPE							
Bulgaria	C	709	235				
Czechoslovakia	C	22					
France:							
Seine Department	C	1					
Unoccupied zone	C	229					
Germany	C	[3] 2,043	800				
Great Britain	C	1					
Hungary	C	827	120	8	56	89	47
Irish Free State	C	29					7
Portugal	C	1					
Rumania	C	3,992	1,207	593	497	532	432
Slovakia	C	6	[4] 122				
Spain	C	4,144	83				
Canary Islands	C	1					
Switzerland	C	4					
Turkey	C	427	436				
Union of Soviet Socialist Republics	C	67					

[1] Suspected. [2] Hospitalized cases. [3] In German territory as of 1919. [4] Jan. 3 to Mar. 13, 1943.

TYPHUS FEVER—Continued

[C indicates cases]

Place		January–December 1942	January–February 1943	March 1943—week ended— 6	13	20	27
NORTH AMERICA							
Guatemala	C	251	172				
Jamaica	C	53	5	1			
Mexico	C	978	110				
Panama Canal Zone	C	1					
Puerto Rico	C	1					
Salvador	C	1					
SOUTH AMERICA							
Argentina	C	1					
Chile	C	128	15				
Colombia	C	89					
Ecuador	C	171	53	4	10	5	2
Peru	C	923					
Venezuela	C	27					
OCEANIA							
Australia	C	42	17			1	1
Hawaii Territory	C	49	4	1			1

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA							
Belgian Congo:							
Libenge	D	[1] 2					
Stanleyville	D			1			
British East Africa: Kenya	C	1					
French West Africa	C	1					
Gold Coast	C	[2] 3					
Ivory Coast	C	[2] 7					
Nigeria	C	2					
Senegal [3]	D	1					
Sierra Leone: Freetown	C	2					
Sudan (French)	D	[1] 2					
Togo	C	2					
SOUTH AMERICA							
Bolivia:							
Chuquisaca Department	D	1					
La Paz Department	C	7					
Santa Cruz Department	C	18					
Brazil:							
Acre Territory	D	4					
Bahia State	D	1					
Para State	D	1					
Colombia:							
Boyaca Department	D	5					
Cundinamarca Department	D	4					
Intendencia of Meta	D	5	2				
Santander Department	D	4					
Venezuela: Bolivar State	C	2					

[1] Includes 1 suspected case.
[2] Includes 2 suspected cases.
[3] According to information dated Feb. 9, 1942, 15 deaths from yellow fever among Europeans have occurred in Senegal.