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CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

July 18–August 14, 1937

The accompanying tables summarize the prevalence of eight important communicable diseases based on weekly telegraphic reports from State Health Departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of Disease." Table 1 gives the number of cases of poliomyelitis reported by each State in recent weeks of 1937 and in corresponding weeks of 1936, 1935, and 1934, and table 2 gives the number of cases of eight important communicable diseases, including poliomyelitis, for the 4-week period ending August 14, the number reported for the corresponding period in 1936, and the median number for the years 1932–36.

DISEASES ABOVE MEDIAN PREVALENCE

Poliomyelitis.—The number of cases of poliomyelitis rose from 771 for the 4 weeks ending July 17 to 1,589 for the current 4-week period. For the corresponding period in 1936, 1935, and 1934 the numbers of cases totaled 515, 1,433, and 1,035, respectively. In 1936 a minor epidemic was in progress at this time in the East South Central region. In 1935 a more severe epidemic started in South Carolina and was confined mostly to the Atlantic seaboard States. In 1934 the disease was epidemic in California and other western States. In 1933 there was a minor outbreak about this time of the year in the North Atlantic regions and a total of 667 cases was reported, while in 1931 a much more severe epidemic was present in the same regions, when there were 2,974 cases reported. In 1932 and 1929 the numbers of cases for this period totaled 395 and 314, respectively.

Table 1 shows for each State the number of cases of poliomyelitis reported since the beginning of the current year, with comparative data for the corresponding period of 3 preceding years. It includes also the weekly number of cases in each State for recent weeks of 1937.

The current epidemic has been confined largely to the South Central and East North Central regions. Of the 3,448 cases reported during the first 33 weeks of 1937, the West South Central region reported 1,006, the East South Central 430, and the East North Central 604

cases, or more than one-half of the total for the country. During these 33 weeks, however, a number of States in other regions reported significant increases over the 3 preceding years— Missouri (110 cases), Kansas (65), Nebraska (64), Georgia (52), Colorado (39), Maine (38), Iowa (35), and Wyoming (12).

TABLE 1.—*Poliomyelitis cases reported in each State during recent weeks of 1937* [1]

Division and State	33 weeks ended—				Cases reported in 1937 for week ended—											
	Aug. 18, 1934	Aug. 17, 1935	Aug. 15, 1936	Aug. 21, 1937	May 29	June 5	June 12	June 19	June 26	July 3	July 10	July 17	July 24	July 31	Aug. 7	Aug. 14	Aug. 21
All States [2]	4,064	3,527	1,341	3,448	21	36	38	60	82	158	256	275	324	401	409	455	492
New England:																	
Maine	9	14	22	38	0	0	0	0	0	1	2	0	4	3	13	8	6
New Hampshire	7	20	3	6	0	0	0	0	0	0	0	1	1	2	0	1	1
Vermont	6	0	9	7	0	0	0	0	0	0	0	1	0	0	0	2	3
Massachusetts	44	279	36	118	0	1	1	3	1	2	3	2	10	13	12	25	41
Rhode Island	1	33	2	3	0	0	0	0	0	0	0	0	0	0	1	2	0
Connecticut	6	91	6	17	0	0	0	0	0	0	2	0	0	2	3	3	6
Middle Atlantic:																	
New York	105	640	76	139	0	4	0	2	3	2	6	10	8	11	17	22	39
New Jersey	40	71	15	40	0	0	0	1	0	2	1	1	1	5	3	6	14
Pennsylvania	50	49	42	67	1	0	1	1	0	1	0	1	0	6	11	14	21
East North Central:																	
Ohio	79	43	30	225	1	2	0	1	2	2	9	14	20	48	38	45	22
Indiana	16	11	11	67	0	0	0	0	1	0	1	8	7	15	7	8	12
Illinois	87	68	79	189	1	0	1	0	1	2	2	8	11	26	28	32	54
Michigan	49	85	32	90	1	1	0	3	0	1	1	2	4	10	14	24	21
Wisconsin	20	20	8	33	1	0	0	1	1	0	1	0	2	2	6	10	6
West North Central:																	
Minnesota	28	22	7	35	0	0	0	0	1	0	0	1	1	1	9	5	10
Iowa	11	19	10	35	0	0	0	0	0	0	0	1	3	3	4	6	7
Missouri	17	16	16	110	0	1	1	1	1	1	22	4	16	16	16	16	13
North Dakota	2	2	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0
South Dakota	17	2	2	5	0	0	0	0	0	0	0	0	0	0	1	0	1
Nebraska	8	8	7	64	0	2	1	0	0	1	0	4	4	11	7	14	15
Kansas	31	12	19	65	0	0	0	1	1	2	3	4	4	7	13	13	13
South Atlantic:																	
Delaware	1	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Maryland	15	30	7	30	0	0	0	0	0	0	0	0	1	7	3	13	5
District of Columbia	5	29	1	8	0	0	0	0	0	0	0	0	0	1	0	1	3
Virginia	33	528	21	38	0	0	0	3	3	1	3	3	1	5	4	4	1
West Virginia	31	16	13	38	0	0	0	0	0	1	0	2	1	4	12	1	5
North Carolina	30	548	34	69	2	0	1	3	6	7	4	8	9	6	4	6	5
South Carolina	9	21	15	18	0	1	2	0	1	1	0	1	1	1	1	2	0
Georgia	10	12	24	52	0	1	2	0	1	4	6	4	3	2	6	0	5
Florida	14	13	10	17	1	0	0	0	1	0	0	0	0	1	0	2	3
East South Central:																	
Kentucky	38	82	30	93	0	2	0	0	2	2	7	5	18	33	9	2	4
Tennessee	22	48	138	87	1	0	2	9	7	19	11	7	10	6	3	1	1
Alabama	26	40	298	41	1	0	1	4	5	2	4	1	1	1	3	4	2
Mississippi	15	8	45	209	5	9	7	17	18	30	20	20	13	13	8	11	11
West South Central:																	
Arkansas	8	10	4	248	0	1	4	3	7	26	36	36	48	26	16	19	10
Louisiana	11	69	11	72	0	1	2	1	2	7	8	7	7	5	7	8	6
Oklahoma	6	9	6	288	0	0	3	1	8	7	55	46	53	28	30	23	19
Texas	56	42	20	398	1	3	5	6	0	23	36	52	31	42	58	45	51
Mountain: [3]																	
Montana	75	4	6	8	0	0	0	0	0	0	1	0	1	0	2	1	3
Idaho	70	1	9	5	0	0	0	0	0	1	0	0	0	0	0	0	0
Wyoming	2	1	1	12	0	0	0	0	0	0	0	1	1	1	2	6	0
Colorado	9	6	10	39	0	0	0	0	0	1	0	1	3	2	2	8	21
New Mexico	10	5	4	12	0	0	0	0	0	0	1	0	2	0	0	2	1
Arizona	51	6	3	9	0	0	0	0	0	1	2	0	2	1	0	0	0
Utah	4	3	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0
Pacific:																	
Washington	240	20	21	13	0	0	0	0	0	1	0	0	0	0	1	0	3
Oregon	26	5	11	24	0	1	0	2	0	0	0	0	1	1	2	1	3
California	2,614	463	160	253	5	6	4	6	9	7	8	19	21	34	33	36	25

[1] A table showing the distribution of cases by geographic regions for the period May 9 to July 24, 1937, appeared in the Public Health Reports for Aug. 6, 1937, p. 1070.

[2] Exclusive of Nevada, from which State no reports are received.

In the South Central regions, where the epidemic apparently started, the number of cases reported from Mississippi and Arkansas declined definitely during the 3 weeks ended August 21. The disease also appeared to be on the decline in Oklahoma but was still quite prevalent in Texas. In other sections of the country, some States which had been reporting more than the usual number of cases for this season of the year show a lower incidence during the last week for which data are available (August 15–21) than during the preceding weeks, while other States, such as Massachusetts (41 cases), New York (39 cases), Pennsylvania (21 cases), Illinois (54 cases), and Colorado (21 cases) reported the highest incidence for the season during this week.

Meningococcus meningitis.—The number of cases of meningococcus meningitis (250) was about 85 percent of the number reported for the corresponding period in each of the 2 preceding years (287 and 292, respectively). In 1934, 1933, and 1932 the numbers of cases for this period totaled 130, 147, and 157, respectively. The current excess over the years 1932–36 is almost entirely confined to the South Atlantic and South Central regions. In all other sections the incidence of meningitis, which has been relatively high in the country as a whole since the beginning of 1935, has dropped to the level of more normal years.

Smallpox.—The number of cases of smallpox, though showing a seasonal decline, maintained its excess over recent years. With the exception of 11 cases reported from New York, the highest incidence was still confined to States in the North Central, Mountain, and Pacific regions.

Measles.—The incidence of measles was about 30 percent in excess of that for the corresponding period of 1936 but was considerably lower than in the 2 preceding years. Each region, except the New England and Pacific areas, contributed to the current increase over last year. In the East North Central and East South Central regions the incidence was more than 3 times that for this period last year and other regions reported significant increases. In the New England and Pacific regions the current incidence was the lowest for this period in recent years.

Typhoid fever.—For the 4 weeks ending August 14 the mumber of reported cases of typhoid fever was 2,704, as compared with 2,058, 2,895, and 3,760 for the corresponding period in the years 1936, 1935, and 1934, respectively. The current incidence was about 30 percent in excess of that of last year, when the number of reported cases for this period was the lowest on record. Each region, except the New England and Mountain regions, reported an excess of cases over last year. States in which sharp increases occurred are as follows: Arkansas, Illinois, Kansas, Maryland, Missouri, Ohio, Pennsylvania, and Virginia.

TABLE 2.—*Number of reported cases of 8 communicable diseases in the United States during the 4-week period June 20–July 17, 1937, the number for the corresponding period in 1936, and the median number of cases reported for the corresponding period 1932–36* [1]

Division	Diphtheria			Influenza [2]			Measles [2]			Meningococcus meningitis		
	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median
United States [1]	1,158	1,111	1,476	937	727	1,015	8,294	6,488	7,626	250	287	157
New England	60	52	54	3	1	2	400	1,112	958	11	9	9
Middle Atlantic	158	209	253	22	26	18	3,152	2,631	2,847	49	60	39
East North Central	205	211	255	107	128	187	2,571	800	2,006	45	51	51
West North Central	74	91	149	143	71	48	169	128	281	14	14	16
South Atlantic	219	188	265	224	129	320	677	535	732	48	66	17
East South Central	126	97	174	56	97	87	352	104	193	35	47	15
West South Central	192	148	257	261	181	185	317	163	163	25	7	7
Mountain	33	33	34	66	37	28	422	252	252	8	10	6
Pacific	91	82	116	55	57	77	234	763	763	15	23	8
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid fever		
United States [1]	1,589	515	667	3,796	4,442	4,068	357	239	209	2,704	2,058	3,735
New England	105	22	33	200	301	301	0	0	0	39	70	48
Middle Atlantic	104	33	177	747	1,055	1,023	11	0	0	190	141	225
East North Central	357	55	70	1,412	1,425	1,205	60	67	37	276	165	426
West North Central	172	20	36	431	570	303	160	81	63	203	111	275
South Atlantic	102	35	35	286	243	310	6	3	3	613	467	889
East South Central	136	271	41	149	107	173	4	1	1	488	427	777
West South Central	446	5	21	207	150	150	0	2	28	739	526	714
Mountain	37	13	5	135	196	119	71	75	36	55	81	89
Pacific	130	61	61	229	395	389	45	10	65	101	70	70

[1] 48 States. Nevada is excluded and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City. The median is for the years 1933–36 only; the data for 1932 are not comparable.
[3] 46 States. Mississippi and Georgia are not included.

DISEASES BELOW MEDIAN PREVALENCE

Scarlet fever.—The number of cases of scarlet fever (3,796) was the lowest reported for this period in 7 years; it represented a decrease of about 15 percent from the figure for the corresponding period in 1936 and was about 10 percent below the 1932–36 median. Only the South Atlantic and South Central regions reported an increase over last year; other regions reported very substantial reductions. This disease has been unusually prevalent in the North Central regions for the past 3 or 4 years, and there the current incidence was somewhat above the seasonal expectancy; the incidence in the West South Central region was also slightly above normal for this season of the year.

Diphtheria.—For the second consecutive 4-week period the incidence of diphtheria (1,158 cases) exceeded that for the corresponding period in 1936, again interrupting the steady decline of this disease that has been in progress for several years. The increase was almost entirely due to an excess of cases in the South Atlantic and South Central regions; the figures for other regions closely approximated last year's figures. Compared with the preceding 5-year median the

incidence of diphtheria has been low in the country as a whole and also in each region, except the New England and Mountain areas.

Influenza.—The influenza incidence was slightly higher than at this time in 1936, but the situation was quite favorable for this season of the year. The numbers of cases occurring in the West North Central and West South Central regions were slightly above the seasonal expectancy, but in all other regions the incidence was about normal.

MORTALITY, ALL CAUSES

The average mortality rate for large cities during the 4-week period ended August 14, based on data received from the Bureau of the Census, was 10.2 per 1,000 inhabitants (annual basis). The rates for the corresponding period in the years 1936, 1935, and 1934 were 11.9, 10.0, and 10.5, respectively.

STUDIES IN CHEMOTHERAPY

VI. THE CHEMOTHERAPY OF CHORIOMENINGITIS VIRUS INFECTION IN MICE WITH SULPHONAMIDE COMPOUNDS*

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The chemotherapeutic action of Prontosil was announced 2 years ago by Domagk (*1*), and at that time this action was thought to be highly specific against streptococcal infections. Trefouel, Nitti, and Bovet (*2*) later found that a fraction of the Prontosil molecule, para-aminobenzene sulphonamide (sulphanilamide), was equally capable of curing streptococcal infections. Following this discovery it has been possible to show that sulphanilamide is not limited in action to streptococci, but that it possesses curative effects upon a number of other bacterial infections (*3*) (*4*) (*5*).

There is also evidence suggesting that specific compounds may be developed which exhibit specialized activity against certain types of infection. Thus, in comparisons which were made in mice by Rosenthal, Bauer, and Branham (*6*), sulphanilamide is more effective against streptococci, meningococci and pneumococci than is Prontosil, while a new compound which we developed, di-sulphanilamide, is more effective against streptococci and meningococci, but less effective against pneumococci, than is sulphanilamide.

Upon the basis of evidence just cited, preliminary experiments were undertaken with a number of sulphonamide compounds upon some virus infections in mice. It is of interest that a virus infection has been found which is favorably influenced by drug therapy, and

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that at the present stage of our investigation this activity is shown specifically by Prontosil (4-sulphonamide-2-4'-diamino-azobenzene).[1] No appreciable effects were obtained with the related compounds, Prontosil Soluble, sulphanilamide, or di-sulphanilamide, although these compounds are more active than Prontosil against bacterial infections.

The therapeutic action of Prontosil upon virus infections in mice has so far shown itself to be limited to the virus of choriomeningitis. We have been unable to demonstrate activity upon the virus of encephalitis (St. Louis type) or upon the virus of influenza with any of the sulphonamide compounds studied. Levaditi also obtained negative results with Prontosil upon herpes virus infection in rabbits, and upon the virus of lymphogranuloma inguinale in a monkey (*6*).

TECHNIQUE

The choriomeningitis virus employed was the original strain isolated and described by Armstrong and Lillie (*8*). While the symptoms produced in animals from intracerebral inoculation are referred principally to the central nervous system, this disease has been shown to be a systemic infection in that the virus can be recovered in high titer from the blood and various organs of monkeys (Armstrong, Wooley, and Onstott (*9*)), and also in that the pathologic lesions are widespread (Lillie (*10*)).

The material for inoculation in these experiments represents suspensions in saline of brains removed from mice during the final stages of the disease. Either freshly removed brains were used or those preserved in 50 percent glycerine for a few days. The dilutions of virus represent the dilution of mouse brain, by weight, in 0.85 percent salt solution buffered at pH 7.6. Mice were lightly anesthetized with ether, and under sterile precautions 0.03 cc of this material was inoculated intracerebrally.

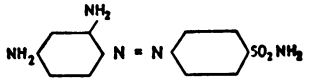
The virus is maintained by mouse passage; virulence for mice can usually be increased by passage of the virus through guinea pigs.

Therapy was begun within an hour after inoculation in all cases. The drugs were suspended in olive oil in 20 to 40 percent concentrations, by grinding in a mortar. All injections were made subcutaneously with a tuberculin syringe and a gage 20 needle. Injections were repeated at intervals of 1 to 2 days up to the sixth or seventh day, at which time symptoms of the disease ordinarily manifest themselves. The dosage of the drugs was large, from one-third to two-thirds of the maximum tolerated dose being employed in each case.

We have compared the action of Prontosil, Prontosil Soluble, sulphanilamide, di-sulphanilamide, and chrysoidine R (an azo dye,

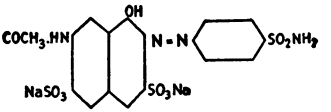
[1] Obtained from Winthrop Chemical Co. This refers to the original Prontosil of Domagk and is not to be confused with the Prontosil Soluble marketed in this country also under the name Prontosil.

related to Prontosil but containing no sulphamido group). Their chemical relationship is shown by the following formulae:

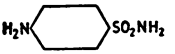


PRONTOSIL

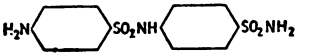
CHRYSOIDINE R



PRONTOSIL SOLUBLE



SULPHANILAMIDE



DI-SULPHANILAMIDE

RESULTS

A preliminary experiment upon a small group of mice showed that Prontosil possessed therapeutic activity, while Prontosil Soluble and sulphanilamide were inactive (experiment 1, table 1). This was confirmed on a larger scale when all of the drugs in the present series were compared. No appreciable curative action was demonstrated for any of them except Prontosil, which in this experiment brought about the survival of 13 out of 15 mice, as compared with 3 survivors out of 25 controls (exp. 2, table 1; also chart 1).

The virus in the above-mentioned experiments was of moderate virulence, a condition which we have found more favorable for the demonstration of chemotherapeutic activity. A further study of the action of Prontosil on the choriomeningitis virus revealed that curative action was less marked when the virus was highly virulent, and that the majority of mice could be saved only when the infective dose of virus was small, approximating a single fatal dose. In every experiment, however, some prolongation of life occurred among the treated animals.

In experiment 3 (table 1) a virus (mouse brain) dilution of 1 to 700 was employed. This represented a high infective dose, as evidenced by the fact that 92 percent of the controls died on the fifth and sixth days. Of the 24 animals treated with Prontosil, one-third survived, while the remainder showed a prolongation of life from 1 to 3 days.

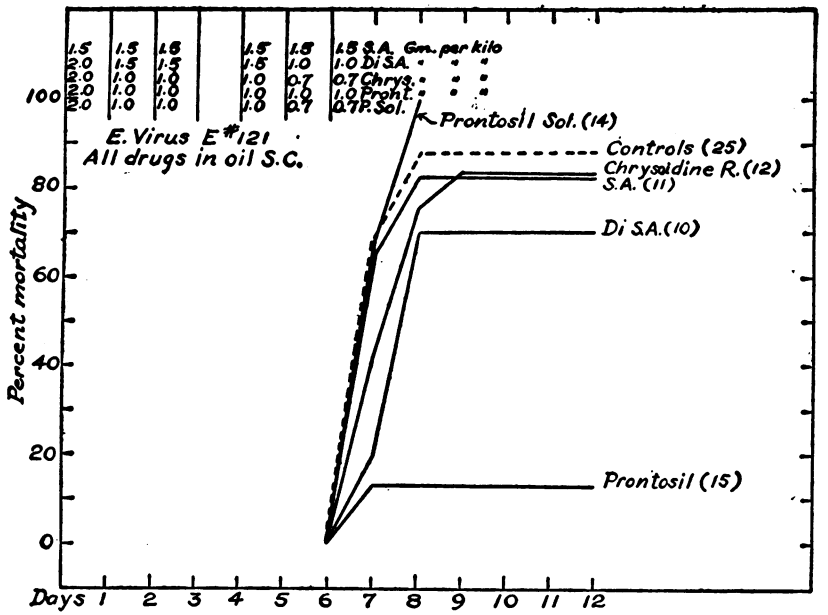


CHART 1.—Comparative results with sulphonamide compounds in choriomeningitis virus infection. Only Prontosil is effective. (Dosage of drugs is shown on the chart. The numbers of mice used are shown in parentheses.)

TABLE 1.—*Curative action of Prontosil in choriomeningitis virus infection in mice. The virus was inoculated intracerebrally; drugs were injected subcutaneously, suspended in olive oil*

Experiment no.	Virus dilution	Therapy [1]	Number of mice	Deaths: Day after inoculation 5	6	7	8	9	10	11	12	Mortality, per cent
1	1: 2,000	None	5	---	---	5	---	---	---	---	---	100
		Pr. 2 gms/kilo in 1 hr.; 1 gm/kilo on 2d, 3d, 5th days.	5	---	---	2	---	---	---	---	---	40
		Pr. Sol. 1 gm/kilo in 1 hr. and on 2d, 3d, 4th days.	5	---	---	5	---	---	---	---	---	100
		S. A. 1 gm/kilo in 1 hr. and on 2d, 3d, 4th days.	5	---	---	5	---	---	---	---	---	100
2	1: 1,000	None	25	---	---	17	5	---	---	---	---	88
		Pr. 2 gms/kilo in 1 hr.; 1 gm/kilo on 1st, 2d, 4th, 5th, 6th days.	15	---	---	2	---	---	---	---	---	13
		Pr. Sol. 2 gms/kilo in 1 hr.; 1 gm/kilo on 1st, 2d, 4th days; 0.7 gm on 5th and 6th days.	14	---	---	9	5	---	---	---	---	100
		Chrys. 2 gms/kilo in 1 hr.; 1 gm/kilo on 1st, 2d, 4th days; 0.7 gm on 5th, 6th days.	12	---	---	5	4	1	---	---	---	83
		S. A. 1.5 gms/kilo in 1 hr. and on 1st, 2d, 4th, 5th, 6th days.	11	---	---	7	2	---	---	---	---	82
		Di-S. A. 2 gms/kilo in 1 hr.; 1.5 gms/kilo on 1st, 2d, 4th, days; 1 gm/kilo on 5th, 6th days.	10	---	---	2	5	---	---	---	---	70
3	1: 700	None	24	---	22	2	---	---	---	---	---	100
		Pr. 2 gms/kilo in 1 hr.; 1 gm/kilo daily for 5 days.	24	---	2	11	2	---	1	---	---	66

[1] *Pr.* = Prontosil; *Pr. Sol.* = Prontosil Soluble; *Chrys.* = Chrysoidine R; *S. A.* = Sulphanilamide; *Di-S. A.* = Disulphanilamide.

TABLE 1.—*Curative action of Prontosil in choriomeningitis virus infection in mice. The virus was inoculated intracerebrally; drugs were injected subcutaneously, suspended in olive oil*—Continued

Experiment no.	Virus dilution	Therapy	Number of mice	Deaths								Mortality, percent
				Day after inoculation								
				5	6	7	8	9	10	11	12	
4	1: 1,000	None	10	---	10	---	---	---	---	---	---	100
		Pr. 1.5 gms/kilo in 1 hr.; 1 gm/kilo on 1st, 3d, 4th, 5th days.	10	---	8	2	---	---	---	---	---	100
	1: 2,000	None	10	---	10	---	---	---	---	---	---	100
		Pr. as above	10	---	---	9	1	---	---	---	---	100
	1: 4,000	None	10	---	10	---	---	---	---	---	---	100
		Pr. as above	10	---	---	9	---	---	---	---	---	90
	1: 8,000	None	10	---	7	3	---	---	---	---	---	100
		Pr. as above	10	---	---	8	---	---	---	---	---	80
	1: 16,000	None	10	---	10	---	---	---	---	---	---	100
		Pr. as above	10	---	---	9	---	---	---	---	---	90
5	1: 1,000	None	10	---	6	4	---	---	---	---	---	100
		Pr. 2 gms/kilo in 1 hr.; 1 gm/kilo daily for 5 days.	10	---	---	9	---	---	---	---	---	90
	1: 5,000	None	10	---	7	3	---	---	---	---	---	100
		Pr. as above	10	---	---	6	3	---	---	---	---	90
	1: 25,000	None	10	---	---	10	---	---	---	---	---	100
		Pr. as above	10	---	---	7	3	---	---	---	---	100
	1: 125,000	None	10	---	---	10	---	---	---	---	---	100
		Pr. as above	10	---	---	2	2	1	1	1	---	70
	1: 625,000	None	10	---	---	1	5	3	1	---	---	100
		Pr. as above	10	---	---	---	2	2	---	---	---	40
6	1: 100,000	None	20	---	---	---	1	7	---	1	2	55
		Pr. 1 gm/kilo in 1 hr. and on 1st, 2d, 4th days.	20	---	---	---	1	---	---	---	---	5

At this time the virus was submitted to passage through guinea pigs to increase its virulence. As a result, the virus became very highly virulent; and in a subsequent experiment with five dilutions of the virus ranging from 1:1,000 to 1:16,000, Prontosil therapy brought about the survival of only 10 to 18 percent of the mice in the groups infected with 1:4,000, 1:8,000, and 1:16,000 dilutions. None survived the 1:1,000 and 1:2,000 dilutions (experiment 4). Some prolongation of life was apparent in all cases. A further experiment employing lower infective doses was accordingly carried out. The virulence was found such that all untreated animals succumbed to a virus dilution of 1:625,000. With this dilution 60 percent of the animals treated with Prontosil survived, while 30 percent survived inoculation with a dilution of 1:125,000 (experiment 5; also chart 2).

In an experiment done 3 weeks later, the virus had undergone a lessening of virulence so that only 55 percent of 20 control animals died following inoculation with 1:100,000 dilution. Among a similar group treated with Prontosil the mortality was reduced to 5 percent (experiment 6).

DISCUSSION

The results of these experiments are of interest in that they represent, as far as we are aware, the first instance of chemotherapeutic activity of a drug against a virus disease.

Differences in chemotherapeutic behavior of sulphonamide compounds have previously been shown in that certain of them possess selective activity against specific types of bacterial infections. These differences are further illustrated in the action upon the choriomeningitis virus. While Prontosil is inferior to sulphanilamide or some other derivatives against streptococci, meningococci, and pneumococci, against the virus Prontosil is active and these derivatives are inactive. It is hoped that this specialized activity may be of value in the chemical approach to the chemotherapy of virus infections, and work is in progress to obtain more active compounds for this purpose.

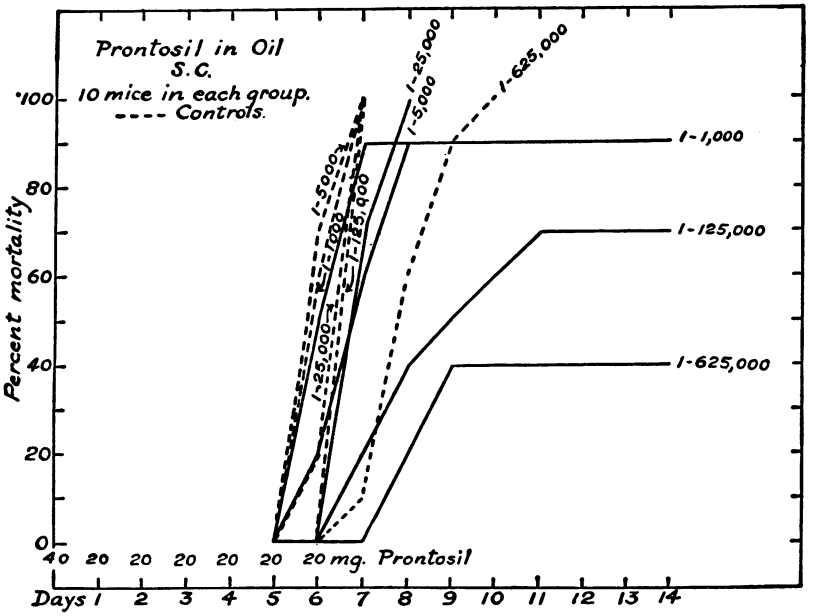


CHART 2.—The curative action of Prontosil on choriomeningitis virus is manifest only when 1 to 5 fatal doses of the virus are employed. (For details of therapy see experiment 5, table 1.)

While the activity of Prontosil has been demonstrated only on choriomeningitis virus, it is possible that related compounds will be effective against other virus diseases.

SUMMARY

Prontosil (4-sulphonamide-2-4′-diamino-azobenzene) has been shown to possess protective action in mice against infection with the virus of lymphocytic choriomeningitis. A high percentage of survivals occurred only when therapy was begun shortly after infection, employing large doses of the drug and small infective doses of the virus.

Prontosil Soluble as well as some related sulphonamide compounds not containing an azo linkage, which are more active than Prontosil against bacterial infections, were found to be inactive against this virus infection.

No therapeutic activity was obtained against the influenza virus or the encephalitis virus (St. Louis type) with Prontosil or the related compounds studied.

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TOXICOLOGY OF SELENIUM

IV. EFFECTS OF EXPOSURE TO HYDROGEN SELENIDE[1]

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Selenium as a possible industrial hazard has so far received but little attention. Quite likely this has been due to its minor industrial application until recent years. As early as 1925, Hamilton (*3*, *4*) reported cases of selenium poisoning in a copper refinery. While such evidence is not conclusive of toxicity (since other factors may be involved), it is indicative. That absorption of selenium does occur in workers employed in the extraction and purification of the element has recently been shown by Dudley (*1*).

The recent investigations on the toxic effects of the ingestion of small quantities of selenium compounds and selenium-bearing vegetation have been summarized by Byers (*2*). The results emphasize the importance of selenium. If ingestion produces such marked effects, it is quite possible that the inhalation of small quantities of selenium compounds would be attended with even more significant results.

The increasing industrial applications of selenium and the fact that workers may be exposed to hydrogen selenide have led the authors to make a further study of the toxicity of this substance. The purpose of this investigation was to determine the toxic limits of hydrogen selenide, H_2Se, in terms of both length of exposure and concentration of the gas. The immediate purpose of this part of the investigation is (*a*) to determine the toxic limits of hydrogen selenide with single expo-

[1] From the Division of Industrial Hygiene, National Institute of Health, Washington, D. C. Manuscript completed Mar. 8, 1937.

sures of 10, 30, and 60 minutes for guinea pigs and (*b*) to determine the effects of such exposures. The results of pathological examinations of the animals are given in order better to fulfill the second of these objectives.

I. TECHNIQUE, APPARATUS, AND METHODS

The apparatus for exposing the animals to a continuous flow of an air-gas mixture of constant composition is shown in figures 1 and 2. The purpose of this type of exposure set-up was two-fold: (1) to secure a continuous flow of an air-gas mixture of constant composition, sufficiently flexible to allow the formation of various concentrations of hydrogen selenide, and (2) to provide an apparatus such that animals might be exposed to a definite concentration for a definite period of time.

A constant flow of the air-gas mixture was desirable in order more nearly to simulate actual conditions and likewise to prevent the increase of carbon dioxide and water vapor in the chamber atmosphere during animal exposure tests.

The apparatus described herein is similar in principle to that described by Fries and West (*5*) (p. 354).

The air stream was drawn through the chamber by means of a pump attached to the outlet. Since the chamber was sealed at all points, the air entering passed through the mixing bulb at the intake port. This intake port was located at the front, upper right-hand side of the chamber, while the exhaust port, connected to the flow meter and pump (see fig. 1), was located at the rear, lower left-hand side of the chamber.

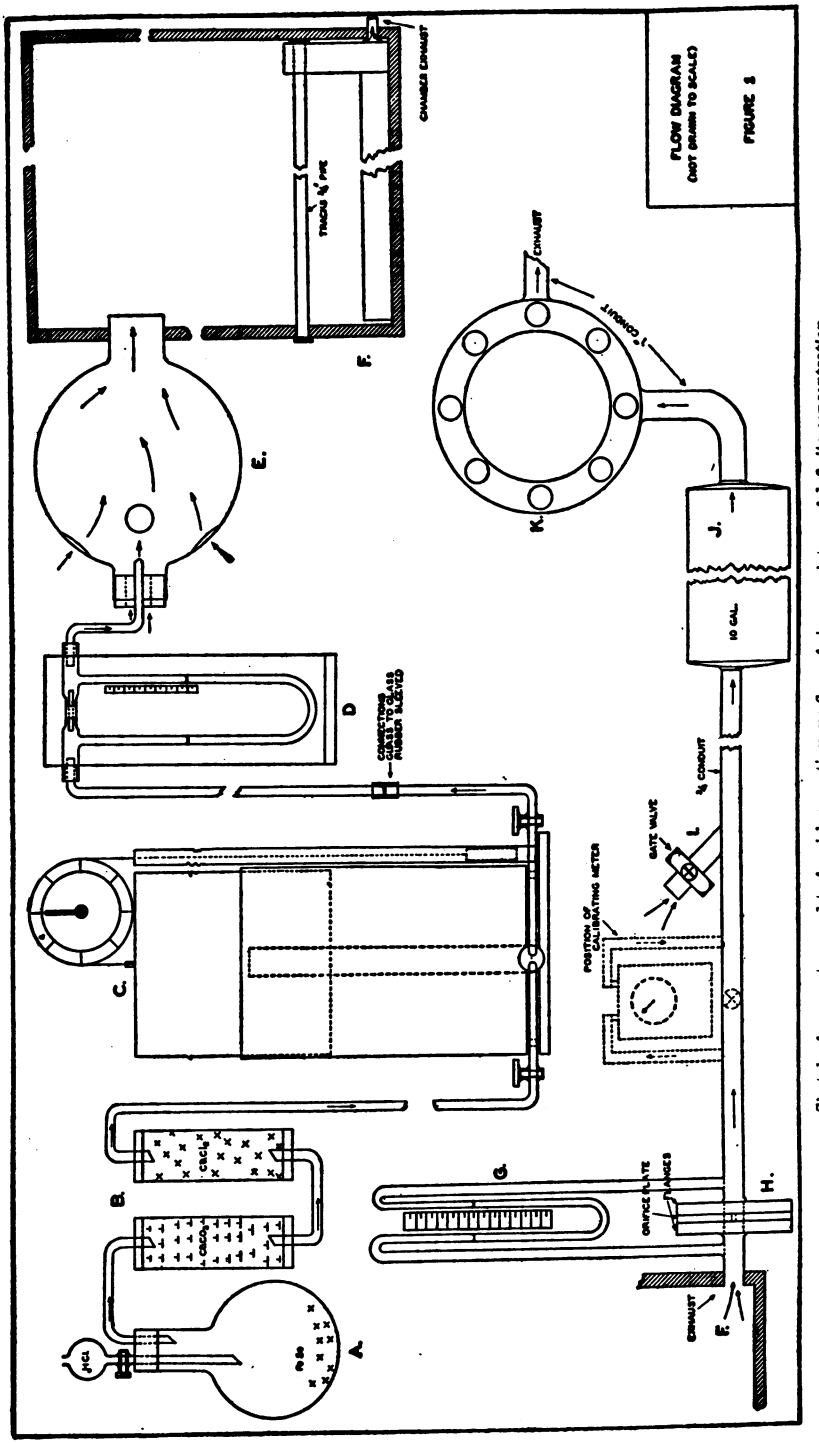
The sliding cage carrier (see fig. 2) was designed to facilitate the exposure of the animals to an air-hydrogen selenide mixture of definite concentration. By this means the animals were introduced into the chamber with a minimum of dilution of the chamber atmosphere. The disadvantages of exposing the animals by placing in a chamber and building up the concentration to the required value are eliminated. By such arrangement as herein described, the dilution is estimated to be less than .5 percent for the first minute and to reach the original concentration in less than 3 minutes.

A. DETAILS OF APPARATUS

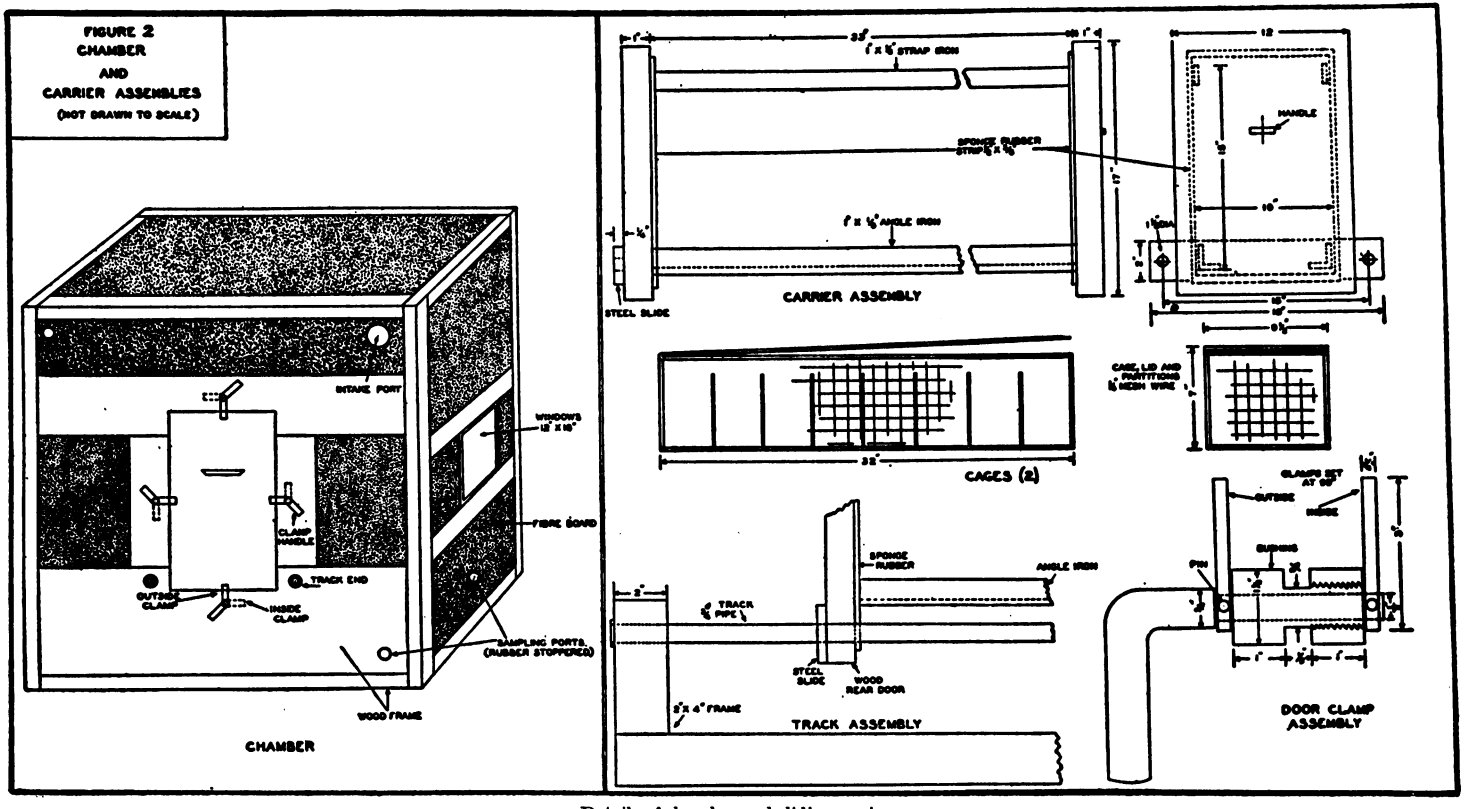
Letters following the names of parts of apparatus refer to those shown in figure 1.

Gas generator and dryer (A, B).—Hydrogen selenide was generated by the action of hydrochloric acid (15 percent by weight HCl) on granular ferrous selenide.

$$2\ HCl + FeSe \longrightarrow H_2Se + FeCl_2$$



Sketch of apparatus used to furnish a continuous flow of air-gas mixture of definite concentration.



Details of chamber and sliding carrier.

On gently heating the mixture there is a moderate evolution of H_2Se. The H_2Se was passed first over calcium carbonate and then over calcium chloride, in large capacity drying tubes. These reagents remove all the moisture and acid vapors which are driven over by heating of acid mixture.

Gasometer (C).—The gasometer used was a standard Sanborn vital capacity spirometer, 6 liters, calibrated in one-tenth liter. U. S. P. liquid petrolatum was used in place of the usual water seal. The H_2Se was led into the spirometer until six liters were present. The generator was then allowed to cool and the generating and drying system closed from the spirometer. By timing the outflow of the H_2Se through the flow meter and reading the volume from the indicator dial, the theoretical concentration was calculated as shown below. An increase in pressure in the spirometer was secured by placing weights on top the float. Such a method of securing a greater flow of H_2Se was easily controlled.

H_2Se flow meter (D).—By varying the weights placed on the spirometer float and likewise varying the size of the capillary orifice, the concentration of H_2Se in the air stream was easily controlled. Liquid petrolatum was used in the manometer as a means of measuring the differential pressures on the orifice.

Mixing bulb (E).—The mixing bulb was constructed from a 3-liter, round-bottom, short-neck, Pyrex flask. A 2-inch glass tube was sealed to the bottom, opposite the neck and parallel with it. Three ¼-inch holes were blown in the flask wall, spaced 2 inches from and equidistant around the neck. As the 200-liter per minute flow of air passed through the bulb, the H_2Se was fed into the neck from a small nozzle. The nozzle was connected directly to the H_2Se flow meter. The swirling motion caused by the three incoming currents of air thoroughly mixed the H_2Se with the air stream before it entered the chamber.

Exposure chamber (F).—Inside dimensions, 1 meter, cube. Capacity, 1,000 liters (less volume of apparatus and animals contained). Constructed of ¼-inch waterproofed Masonite fiberboard; wood frame; glass windows, 12 by 18 inches, 3 sides; coated inside and seams sealed with cellulose acetate (in C. P. acetone). An 8-inch non-oscillating electric fan was used in order to give complete mixing throughout the whole of the interior.

Chamber flow meter (G).—A carefully machined orifice of ½-inch diameter in ¼-inch stainless steel plate was mounted between ¾-inch pipe flanges, ground so as to give gastight joints. A manometer containing liquid petrolatum was mounted to show the differential pressures caused by this orifice. By means of a gate valve (I) at a Y in the suction line back of the orifice, the amount of air flowing past the orifice could be controlled. The flow meter was calibrated under

actual operating conditions, using a standardized American Meter Co. bellows dry-flow meter. This flow meter was connected in the line between the orifice and the Y connection when the chamber flow was calibrated. For results see table 2.

Equalizing chamber (J).—In order to secure a more even flow of air a 10-gallon galvanized expansion tank was placed in the suction line.

Air pump (K).—Leiman, rotary type C, without equalizer on outlet, motor driven. Motor: ½-H. P., 200 V., A. C., 1,750 r. p. m. Pump: 400 r. p. m.; total capacity, 18½ cubic feet per minute. Three-fourths inch conduit from chamber to equalizer tank; 1-inch pipe to pump; 1-inch conduit exhaust to stack.

B. METHODS OF SAMPLING AND ANALYSIS

1. *Analytical concentrations.*—The analytical method used to obtain the concentrations of hydrogen selenide has been fully described in a previous paper for air-diethyl selenide mixtures (*1*). Air samples were drawn from the chamber through two bubblers containing 40 percent HBr with free bromine (10 percent by weight), by means of an aspirating bottle. The selenium was precipitated from the acid solution with sulphur dioxide, and hydroxylamine hydrochloride, filtered, washed, redissolved with brominated HBr, precipitated as before, filtered on weighed Gooch crucibles, dried at 105° C., and weighed as Se.

The total H_2Se in the air sample was calculated by means of the factor 1.03:

$$\frac{\text{Wt. of Se (mg)} \times 1.03}{\text{Vol. of sample (liters)}} = \text{Conc. in chamber (mg of } H_2Se/l).$$

2. *Theoretical or calculated concentrations.*—The theoretical concentrations were calculated in order to check the analytical figures and to determine the relative accuracy of the two methods of evaluating gas-air concentrations.

The gas contained in the spirometer was drawn into two gas-sampling bottles of known volume. These gas samples were analyzed for total selenium by absorbing the gas in 45 percent hydrobromic acid with 10 percent free bromine, and the selenium determined as previously indicated. On converting the Se found to mg H_2Se and substituting the values in the following formula, the chamber concentration can be found with fair accuracy:

$$\frac{\text{Total vol. of gas from spirometer (cc)} \times \text{av. mg } H_2Se/\text{cc in sample}}{\text{Rate of flow through chamber} \times \text{length of run (min.)}} = \text{Conc. (mg } H_2Se/l)$$

(For results see test runs E, F, and G, table 1.)

The theoretical concentrations were determined in order to check the relative accuracy of the two methods. In all animal exposure tests, the concentrations reported were obtained by the analytical procedure outlined above. The concentrations reported for animal

exposure tests are the results of analysis of air samples taken during the time of exposure.

The relation between analytical and theoretical concentrations is shown in table 1. The constant positive error of the theoretical concentrations is explained by reason of decomposition and absorption of hydrogen selenide in the spirometer. Minor leaks may also contribute to this error, since the diminution of volume in the spirometer is calculated as the total H_2Se entering the chamber. A sample calculation is given below, based on the above formula and data from test run E:

Analytical concentration 0.40 mg H_2Se/l.
Theoretical concentration:
Rate of chamber flow=200 l/min.
Length of run=38 min.
Total gas from spirometer=3,000 cc.
Spirometer gas=32.94% H_2Se.
Spirometer gas=1.093 mg H_2Se/cc.
Concentration (calculated)=0.43 mg H_2Se/l.
Error=+6.9%.

TABLE 1.—*Comparison of analytical and calculated concentrations*

Run no.	Analytical concentrations mg H_2Se/l	Calculated concentrations mg H_2Se/l
E	0.40	0.43
F	0.55	0.59
G	0.23	0.28

C. CALIBRATION OF APPARATUS

As the purpose of the chamber set-up previously described was to furnish a constant stream of air-gas mixture of constant composition, certain determinations were necessary in order to check the efficiency of the apparatus.

The results of calibration of the chamber flow are shown in table 2. A standard flow meter was coupled in the line (see fig. 1), and the flow was determined at various manometer settings.

TABLE 2.—*Calibration of chamber flow*

Run	Time of flow		Total flow	Manometer difference	Average flow, liters/minutes
	Minutes	*Seconds*	*Cubic feet*	*mm*	
1	5	4	45	66	251.4
2	8	1	71	66	250.7
3	5	6	26	20	144.3
4	5	6	26	20	144.3
5	10	9	52	20	145.0
6	6	6	44	42	204.5
7	7	5	51	42	203.7
8	4	4	29	40	201.8
9	7	3	50	40	200.7
10	8	1	56	36	197.7
11	10	4	70	36	196.8
12	13	5	93	38	201.2
13	14	3	100	38	201.4
14	60	7	426	38	201.5

A constant flow of 200 liters per minute was desired. Runs 12, 13, and 14 indicate that this flow may be maintained with an error of less than 1.0 percent.

The results of test runs B and C shown in table 3 indicate that concentrations may be held constant for a period of 2 hours at relatively high concentrations of H_2Se. The low value of the 10- to 15-minute sampling period of run B is explained by the fact that the concentration was not built up to constant value before this time. In all exposure runs, at least 20 minutes were allowed for the concentration to reach a constant value before introducing animals into the chamber.

All air samples of runs B and C were drawn from the center of chamber.

TABLE 3.—*Variation of composition of chamber atmosphere with time*

Test run	Sample [1]	Sampling time	Volume of sample	Weight of Se	Analytical concentration mg H_2Se/l
		Minutes	*Liters*	*Milligrams*	
B	1	10–15	10	5.1	0.53
	2	15–20	10	6.2	.64
	3	20–25	10	5.8	.60
	4	25–30	10	5.8	.60
	5	35–40	10	5.5	.57
	6	45–50	10	5.9	.61
	7	50–55	10	5.7	.59
C	1	10–20	13½	2.8	0.21
	2	30–40	14	2.9	.21
	3	60–70	14	3.0	.22
	4	90–100	14	2.7	.20
	5	120–130	14	2.8	.21

[1] All samples taken from center of chamber.

In order to show that distribution of the H_2Se throughout the chamber was equal, samples were drawn from eight different positions in the chamber. These results (test run D) are given in table 4. Sampling tubes were located at seven corners of the chamber, none being taken at the corner where the air stream enters the chamber. Position 5 was at the center of the chamber where previous samples had been taken.

TABLE 4.—*Distribution of H_2Se in chamber*

Test run	Sample	Sampling time	Volume of sample	Position sampled [1]	Weight of Se	Analytical concentration, mg H_2Se/l
		Minutes	*Liters*		*Milligrams*	
D	1	10– 20	14	2	3.0	0.22
	2	25– 35	14	1	3.2	.24
	3	40– 50	14	5 (c)	3.0	.22
	4	50– 60	14	3	2.9	.21
	5	70– 80	14	4	3.0	.22
	6	80– 90	14	6	2.9	.21
	7	90–100	14½	8	3.1	.22
	8	100–110	14	7	3.1	.23
	9	110–115	14	5 (c)	2.9	.21

[1] Position 5 at center of chamber, remainder at corners.

For animal exposures samples were drawn from the chamber at a level with the animals and within three inches of the cages.

II. RESULTS OF EXPOSURE

A. SYMPTOMS

The immediate effects of hydrogen selenide when guinea pigs are exposed to the higher concentrations is to produce acute eye and nasal irritation as evidenced by pawing of the nose and eyes immediately on being placed in the chamber. At the higher concentrations, as in the 10-minute exposure runs, a copious flow of mucus came from the nasal passages. In the longer exposure tests, at the lower concentrations, the discharge from the nose was much less marked; however, the pawing of the nose and eyes was still evidenced, though less spasmodically. In the 30- and 60-minute exposures, after 15 minutes in the chamber the activity of the animals was reduced to practically nil, although slight pawing of the nose was still evidenced.

Immediately after test, the animals showed a deposit of red, amorphous selenium on the nose and head. The higher concentrations resulted in a greater deposit of selenium because of the spreading of the nasal exudate as the animals pawed the nose and eyes. In large part the selenium deposit was due to the decomposition of hydrogen selenide by the mucus of the nasal passages. No deaths occurred during the exposure period.

Marked gasping for breath, coughing, and choking of the animals persisted for 12 to 24 hours. Gasping was noted in all animals exposed to the lethal concentrations, which persisted for several days after exposure. The animals which survived the initial effects of the exposures showed decreased activity, marked difficulty in breathing, and slight food intake. The animals dying from the delayed effects of the H_2Se exposure showed tetanic convulsions often lasting 8 hours before death ensued.

When men were accidentally exposed to hydrogen selenide, the effects were immediate and drastic. The odor of the gas is similar to that of hydrogen sulphide but causes olfactory fatigue quickly so that toxic concentrations may not be detected after exposure for several minutes to low concentrations of the gas. The effect on the nose and eyes is an acute, burning sensation which persists for as much as an hour after exposure. A copious flow of tears and nasal mucus is induced which partially alleviates the burning sensation. Exposure of man produced no noticeable after-effects, except a metallic taste which persisted for several days. One subject excreted 2.5 parts of selenium per 100 million in his urine 7 days after exposure.

The animals which survived the 30-day observation period following exposure showed increased activity, greater food intake and were apparently in good health, their weight increasing markedly. When

possible, animals were sacrificed at the end of the 30-day period, likewise at 60 days after exposure, in order to determine the course of the resulting pathological changes.

B. MORTALITY DATA

In order to determine the concentrations which prove fatal as a result of 10-minute, 30-minute, and 60-minute exposures, 16 guinea pigs per run were exposed to a graded series of concentrations. The animals were then placed in cages and observations were made on their general condition and on food intake for a 30-day period. Deaths were recorded daily. Tables 5, 6, and 7 show the number of deaths by 5-day periods, for the 10-minute, 30-minute, and 60-minute exposure tests. Control animals were kept in identical cages, in the same location, and on the same diet as the exposed animals. Deaths of control animals are presented to assist in evaluating the relative toxicity of the various exposures to hydrogen selenide.

TABLE 5.—*Mortality of guinea pigs exposed for 10 minutes to H_2Se*

Concentration, mg H_2Se/l	Animals tested	Deaths, in days						Percent dead after 30 days
		1-5	6-10	11-15	16-20	21-25	26-30	
Controls	16	0	0	0	0	1	0	6.3
0.28	16	1	3	0	1	0	0	31.2
0.35	16	7	1	1	0	0	0	56.2
0.55	16	15	0	0	0	0	0	93.7
0.57	16	16	---	---	---	---	---	100

NOTE.—An exposure run was made using 16 guinea pigs, concentration 0.39 mg H_2Se/l, 10-minute exposure. Only 2 of these animals (12.5 percent) died within 30 days. As this was contrary to what might be expected from results of other runs, this exposure was duplicated. This concentration was found to be 0.35 mg H_2Se/l. Nine of the 16 animals exposed (56.2 percent) died within 30 days. See results in above table. No explanation for this discrepancy can be given. See discussion in text.

TABLE 6.—*Mortality of guinea pigs exposed for 30 minutes to H_2Se*

Concentration, mg H_2Se/l	Animals tested	Deaths, in days						Percent dead after 30 days
		1-5	6-10	11-15	16-20	21-25	26-30	
Control	32	3	0	0	0	0	0	9.4
0.002	16	0	1	0	0	0	1	12.5
0.004	16	1	3	0	0	0	0	25.0
0.012	16	4	2	0	0	0	0	37.5
0.020	16	0	0	0	1	5	1	42.7
0.036	16	2	1	2	3	3	0	69.0
0.043	16	4	5	3	3	0	0	93.7
0.24	16	16	---	---	---	---	---	100.0
0.54	16	16	---	---	---	---	---	100.0

TABLE 7.—*Mortality of guinea pigs exposed for 60 minutes to H_2Se*

Concentration, mg H_2Se/l	Animals tested	Deaths, in days						Percent dead after 30 days
		1–5	6–10	11–15	16–20	21–25	26–30	
Controls	32	3	0	0	0	0	0	9.4
0.003	16	0	1	0	0	0	0	6.3
0.004	16	1	0	0	0	0	0	6.3
0.007	16	1	0	1	0	0	0	12.5
0.011	16	2	4	0	0	0	0	37.5
0.014	16	3	2	8	1	0	0	87.5
0.020	16	2	6	6	1	1	-------	100.0
0.022	16	7	5	2	1	0	0	93.7
0.19	16	16	-------	-------	-------	-------	-------	100.0

The guinea pigs used in these tests were normal animals, weighing between 180–265 grams, with the average weight of 248 grams.

In order to clarify certain pathological changes resulting from the hydrogen selenide exposures, 80 normal guinea pigs were exposed 30 minutes to a concentration of *0.022* mg H_2Se/l of air. Animals were killed at suitable intervals and tissues were removed for examinations.

There are certain discrepancies in the results which are evident on examination of the mortality tables. There is no known satisfactory explanation for these differences, since the conditions of the experiments were held constant throughout the whole series of observations.

III. PATHOLOGY

A. ANIMALS KILLED FOR PATHOLOGICAL STUDY

Eighty guinea pigs were exposed to 0.022 mg of hydrogen selenide per liter for a single period of 30 minutes. Forty-seven died as a result of the exposure, and 33 were killed for pathological examination. One hour after exposure, two animals were killed and examined; two were killed every day for 7 days, and at intervals of 2 to 4 days until the twenty-third day after exposure; the remaining four animals were killed and examined on the thirty-eighth and fortieth days. At each autopsy the liver and spleen were weighed, because preliminary observations indicated that these organs showed the greatest change as a result of hydrogen selenide exposure.

Liver.—The most important change noted in the liver was fatty metamorphosis. This occurred in moderate degree in one of the animals killed 1 hour after exposure. In the first 2-day interval, 3 of the 6 animals examined showed moderate fatty changes; in the 3- to 7-day interval, 9 of 11 animals showed moderate to severe fatty changes; and 11 to 17 days after exposure, only a moderate amount of fat was noted in 5 of 8 guinea pigs. After 17 days only one of eight animals showed fatty metamorphosis of any appreciable grade. The fat was of the fine droplet variety, with several droplets generally

occurring in the same cell. They occurred throughout the lobule, but were often most abundant about the portal canals or at the periphery. Congestion of the sinusoids was rarely noted. In a few of the animals examined 7 days after exposure, a slight atrophy of the liver cells about the central vein in a few lobules was present. In 18 animals showing a significant degree of fatty metamorphosis of the liver, the average weight of the liver was 57.8 mg per gram of body weight, whereas in 15 animals with no hepatic fatty metamorphosis the weight was only 48. 1 mg per gram of body weight.

The average weights of the livers showed a fair correlation with the approximate degree of fatty metamorphosis. In the first 2 days, the weight of the liver tissue was 52.2 mg per gram of body weight at a time when only a moderate amount of fat was present. In the 3- to 7-day interval when the most severe fatty metamorphosis occurred, the weight rose to 58.3 mg. In the 11- to 17-day interval, when only a moderate fatty change was noted, the weight was 57.2 mg, and in the 19- to 23-day interval, when hepatic fat was found in one of the two animals, the weight was 52.1 mg per gram of body weight, while in the 38- to 40-day interval, the weight fell to 43.5 mg per gram of body weight.

Spleen.—As the interval between exposure and death increased, an appreciable enlargement of the spleen was noted. This gross hypertrophy became most marked about 11 days after exposure. The splenic weights (mg per gram of body tissue) for animals killed after different intervals were as follows: up to 2 days, 2.4 mg; 3 to 7 days, 2.6 mg; 11 to 17 days, 3.4 mg; 19 to 23 days, 3.5 mg; and 38 to 40 days, 2.1 mg. Histopathologically, an increase in the reticuloendothelial tissue of the splenic pulp was the most prominent feature. There was an apparent increase in the size of the cells rather than an increase in the number of cells. This was evident to a slight degree the third day after exposure and became moderate to marked from the fifth through the twenty-third day. Hyperplasia of the lymphoid tissue was variable, never more than moderate in degree, occasionally slight, and often absent. Congestion of the cavernous veins occurred in only a few animals and was apparently of no significance.

Kidneys.—Fat droplets in sufficient number to indicate an appreciable degree of fatty metamorphosis were noted in 6 of 11 animals examined 3 to 7 days after exposure. In the 11- to 17-day interval, fat was present in four of eight guinea pigs, and in the 19- to 23-day period fat droplets occurred in only one of four animals; none was noted in the 38- to 40-day interval. These fatty changes in the kidney, while making their appearance later, paralleled those found in the liver. Fat droplets in appreciable number occurred in both the liver and kidney in 6 of 11 animals in the 3- to 7-day period and in 5 of 8 animals in the 11- to 17-day period. Fat was noted in both liver and

kidney in one of four animals in the 19- to 23-day period and in none in the 38- to 40-day intervals. Four days after exposure a very slight to moderate congestion of the capillaries of the cortex and occasionally of the medulla was present. No other changes in the renal tissue were noted.

Adrenals.—An irregular variation in the number of fat droplets in the cortex was present throughout the series. In an occasional animal a slight to moderate congestion of the cortex and medulla was noted.

Lungs.—A slight to moderate thickening of the alveolar wall was present in almost all of the animals examined. Slight to moderate congestion of the alveolar capillaries with extravasation of red blood cells and sometimes serum into the alveoli occurred in a number of the animals without particular reference to the time interval after exposure.

Heart.—No abnormal changes were observed.

B. PATHOLOGIC FINDINGS IN ANIMALS EXPOSED TO VARIOUS CONCENTRATIONS

An examination was made of each animal that died during the course of the experiments designed to determine the minimal lethal concentration. The animals that died as a result of hydrogen selenide exposure exhibited essentially the same pathological changes that have just been described. The amount of pathological involvement was more closely related to the time that elapsed between exposure and death than to the concentration of hydrogen selenide to which the animals were subjected or to the length of exposure.

Liver.—Fatty metamorphosis of an appreciable grade occurred in 22 of 28 animals dying within 2 days, in 6 of 10 animals dying in 3 to 7 days, and in 5 of 7 animals dying 8 to 17 days after exposure. No fatty changes were noted in animals dying later than 17 days after exposure. Of 74 surviving animals which were killed at intervals of 30 and 60 days after test, only 2 showed appreciable fatty metamorphosis; one was killed 30 days and the other 60 days after exposure. Concentrations as low as 0.004 mg per liter produced liver damage of this type. Congestion of the sinusoids was occasionally seen in some of the animals dying early in the tests. Slight atrophy of the central liver cells was only rarely noted. No evident fibrosis or necrosis was seen at any time.

Spleen.—In the animals dying in the first 5 days after exposure the spleens were generally small. After the sixth day they progressively increased in size. This hypertrophy was most marked in the animals killed at the end of 30 days. It was present in only two of seven animals killed and examined 60 days after exposure. The most prominent histopathological change was an increase in the reticulo-endothelial tissue of the splenic pulp. Lymphocytic hyperplasia was absent or slight in the animals dying in the first 5 days, but it was

moderate or marked in those killed at 30 days. Congestion of the cavernous veins was infrequently noted. In a number of the animals small hemorrhagic areas were noted in the splenic pulp, but this showed no relation to any particular exposure, concentration, or duration of life.

Kidneys.—Fine fat droplets in varying numbers were noted in the cells of the convoluted tubules and in some cases in the cells of almost all of the tubules. The fatty changes were most marked in the animals which died after exposure. Fat was infrequently noted in the sacrificed animals and then not in significant quantities. Fatty metamorphosis in the kidney and in the liver seems to be associated to a certain extent.

Lungs.—The changes in the lungs varied little in any of the animals, whether dying from the exposure or killed after 30 or 60 days. The alveolar walls showed slight thickening, and congestion of the alveolar capillaries was frequently noted. In the animals dying soon after exposure, alveoli filled with serum and red blood cells were often found; hemorrhagic areas were also present in animals which were sacrificed. Small, scattered areas of atelectasis were present in almost all of the animals examined.

Adrenals.—No particular changes were noted other than a very occasional congestion of the capillaries of the cortex.

Heart.—No changes noted.

Pancreas.—No changes noted.

The pathology produced by single exposures to relatively high concentrations of hydrogen selenide appears to be (1) an early fatty metamorphosis of the liver which seems to disappear by the twentieth day; and (2) hypertrophy of the spleen, primarily reticulo-endothelial in nature, which becomes most marked about the tenth day and progresses through the twenty-third day. Examination 40 days after exposure shows the spleen to be of normal size. The fatty changes in the kidney parallel those in the liver but are not as marked or as constant. The severity of liver, spleen, and kidney pathology seems to depend more on the length of time that intervenes between exposure and death than it does on the concentration of hydrogen selenide or the duration of exposure.

SUMMARY

Guinea pigs were exposed to hydrogen selenide in accurately controlled concentrations ranging from 0.57 to 0.002 mg per liter for single exposures of 10, 30, and 60 minutes. The apparatus is described in detail. All animals exposed to 0.57 mg per liter for 10 minutes died within 5 days; 93 percent of the animals exposed to 0.043 mg per liter for 30 minutes died within 30 days; and all animals exposed to 0.02 mg per liter for 60 minutes died within 25 days. The patho-

logical changes resulting from the exposures were, primarily, an early fatty metamorphosis of the liver and a hypertrophy of the spleen which developed later.

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BIOLOGICAL PRODUCTS

Establishments Licensed for the Propagation and Sale of Viruses, Serums, Toxins, and Analogous Products

There is presented herewith a list of the establishments holding licenses issued by the Treasury Department in accordance with the act of Congress approved July 1, 1902, entitled "An act to regulate the sale of viruses, serums, toxins, and analogous products in the District of Columbia, to regulate interstate traffic in said articles, and for other purposes."

The licenses granted to these establishments for the products mentioned do not imply an endorsement of the claims made by the manufacturers for their respective preparations. The granting of a license means that inspection of the establishment concerned and laboratory examinations of samples of its products are made regularly to insure the observance of safe methods of manufacture, to ascertain freedom from contamination, and to determine the potency or safety, or both, of botulinus antitoxin, diphtheria antitoxin, histolyticus antitoxin, odematiens antitoxin, perfringens antitoxin, scarlet fever streptococcus antitoxin, staphylococcus antitoxin,

tetanus antitoxin, vibrion septique antitoxin, antidysenteric serum, antimeningococcic serum, antipneumococcic serum, bacterial vaccines made from typhoid bacillus, paratyphoid bacillus A, and paratyphoid bacillus B, diphtheria toxin-antitoxin mixture, diphtheria toxoid, diphtheria toxin for Schick test, scarlet fever streptococcus toxin for Dick test, scarlet fever streptococcus toxin for immunization, and the arsphenamines, the only products for which potency standards or tests have been established.

The enumeration of the products is as follows: Serums are placed first, the antitoxins, being more important, heading the list. The other products are arranged generally in the order of their origin. The items in each class are arranged alphabetically.

Establishments Licensed and Products for Which Licenses Have Been Issued

AMERICAN ESTABLISHMENTS

Parke, Davis & Co., Detroit, Mich.—License no. 1:

Diphtheria antitoxin; gonococcus antitoxin; meningococcus antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; anti-influenza bacillus serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; hemostatic serum (Lapenta); normal horse serum; thyroidectomized horse serum; smallpox vaccine; rabies vaccine (Cumming); tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, acne diplococcus, Brucella melitensis, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, prodigiosus bacillus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus and typhoid bacillus, diphtheria toxin-antitoxin mixture; diphtheria toxoid-antitoxin mixture; diphtheria toxoid, staphylococcus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; animal epidermal extracts; animal food extracts; vegetable food extracts; poison ivy extract; pollen extracts; modified bacterial derivatives made from colon bacillus, gonococcus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, gonococcus, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Mulford Biological Laboratories, Sharp & Dohme, Broad and Wallace Streets, Philadelphia, Pa.—License no. 2:

Botulinus antitoxin; diphtheria antitoxin; erysipelas streptococcus antitoxin; B. histolyticus antitoxin; B. odematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; B. sordelli antitoxin; staphylococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antierysipeloid serum; antigonococcic serum; anti-influenza bacillus serum; antimelitensis serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum, antitularemic serum, antivenin (Nearctic crotalidae); antivenin Bothropic; antivenin (crotalus terrificus); antivenin (Latrodectus mactans); acute anterior poliomyelitis immune serum (human); measles immune serum (human); scarlet fever immune serum (human); normal human serum; immune globulin (human); normal horse serum; smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, Brucella melitensis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, bacterium tularense, and typhoid bacillus; sensitized bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; animal epidermal extracts; animal food extracts; vegetable food extracts; poison ivy extract; poison oak extract; pneumococcus antibody solution; bacterial antigens made from acne bacillus, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influ-

enza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, proteus bacillus, pyocyaneus bacillus, staphylococcus aureus, streptococcus, typhoid bacillus; bee venom; snake venom solution.

The Cutter Laboratory, Berkeley, Calif.—License no. 8:

Diphtheria antitoxin; B. edematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; B. sordelli antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antimeningococcic serum; antistreptococcic serum; normal horse serum; smallpox vaccine; rabies vaccine (killed virus); tuberculin old; tuberculin B. F.; bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, staphylococcus aureus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; diphtheria toxin for Schick test; pollen extracts; poison ivy extract; poison oak extract.

Bureau of Laboratories, Department of Health, Foot East Sixteenth Street, New York City.—License no. 14:

Smallpox vaccine.

Lederle Laboratories, Inc., Pearl River, N. Y.—License no. 17:

Diphtheria antitoxin; erysipelas streptococcus antitoxin; B. histolyticus antitoxin; B. edematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; staphylococcus antitoxin; B. sordelli antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; measles immune serum; immune globulin (human); normal horse serum; smallpox vaccine; rabies vaccine (killed virus); tuberculin old; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, Brucella melitensis, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; staphylococcus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract; poison oak extract; animal epidermal extracts; animal food extracts; vegetable food extracts; animal oil extracts; vegetable oil extracts; fungus extracts; snake venom solution.

G. H. Sherman, M. D., Inc., 14600 East Jefferson Avenue, Detroit, Mich.—License no. 30:

Bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; pollen extracts; bacterial antigens made from colon bacillus, gonococcus, micrococcus catarrhalis, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, and streptococcus.

The Abbott Laboratories, Fourteenth Street and C.-W. Interurban Railroad Tracks, North Chicago, Ill.—License no. 43:

Bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, micrococcus tetragenus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, micrococcus catarrhalis, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus; pollen extracts; animal epidermal extracts; animal food extracts; vegetable food extracts; fungus extracts.

The Upjohn Co., Kalamazoo, Mich.—License no. 51:

Bacterial vaccines made from colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, staphylococcus aureus, streptococcus.

E. R. Squibb & Sons' Research and Biological Laboratories, New Brunswick, N. J.—License no. 52:

Diphtheria antitoxin, erysipelas streptococcus antitoxin, perfringens antitoxin, scarlet fever streptococcus antitoxin, staphylococcus antitoxin; tetanus antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; immune globulin (human); normal horse serum; antivenin (Latrodectus mactans); smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; bacterial antigen made from staphylococcus aureus; leucocytic extract from the horse; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract; poison oak extract; arsphenamine, neoarsphenamine, sulpharsphenamine.

Eli Lilly & Co., Indianapolis, Ind.—License no. 56:
Diphtheria antitoxin; erysipelas streptococcus antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; hemostatic serum (Lilly); heterophile antibody; smallpox vaccine; rabies vaccine (Harris); tuberculin old; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial vaccine made from partially autolized pneumococci; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test; bacterial antigens made from acne bacillus, colon bacillus, gonococcus, pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Gilliland Laboratories, Marietta, Pa.—License no. 63:
Diphtheria antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); tuberculin old; tuberculin B. E.; tuberculin, B. F.; bacterial vaccines made from acne bacillus, gonococcus, influenza bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization.

Antitoxin and Vaccine Laboratory, Department of Public Health, Commonwealth of Massachusetts, 375 South Street, Jamaica Plain, Boston 30, Mass.—License no. 64:
Diphtheria antitoxin; scarlet fever streptococcus antitoxin; antimeningococcic serum; antipneumococcic serum; smallpox vaccine; tuberculin old; bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid, diphtheria toxin for Schick test.

United States Standard Products Co., Woodworth, Wis.—License no. 65:
Diphtheria antitoxin; erysipelas streptococcus antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; normal horse serum; smallpox vaccine; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from staphylococcus albus, staphylococcus aureus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract.

D. L. Harris Laboratories, Metropolitan Building, St. Louis, Mo.—License no. 66:
Rabies vaccine (Harris).

The Arlington Chemical Co., Yonkers, N. Y.—License no. 67:
Bacterial vaccines made from colon bacillus, micrococcus catarrhalis, micrococcus tetragenus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, and streptococcus; fungus extracts; pollen extracts; animal epidermal extracts; animal food extracts; vegetable food extracts.

Dermatological Research Laboratories, 1720 Lombard Street, Philadelphia, Pa.—License no. 68:
Arsphenamine; silver arsphenamine; neoarsphenamine; sulpharsphenamine; bismuth arsphenamine sulphonate; neosilver arsphenamine.

The Winthrop Chemical Co., Inc., 33 Riverside Avenue, Rensselaer, N. Y.—License no. 69:
Arsphenamine; arsphenamine diglucoside; neoarsphenamine; sodium arsphenamine; silver arsphenamine; neosilver arsphenamine; sulpharsphenamine.

Diarsenol Co., Inc., 72 Kingsley Street, Buffalo, N. Y.—License no. 70:
Arsphenamine; neoarsphenamine; sodium arsphenamine; sulpharsphenamine.

Mallinckrodt Chemical Works, St. Louis, Mo.—License no. 77:
Arsphenamine; neoarsphenamine; sulpharsphenamine.

Merck & Co., Inc., Rahway, N. J.—License no. 82:
Arsphenamine; neoarsphenamine; sulpharsphenamine.

Terrell Laboratories, Texas National Bank Building, Fort Worth, Tex.—License no. 84:
Rabies vaccine (killed virus).

Jensen-Salsbery Laboratories, Twenty-first and Penn Streets, Kansas City, Mo.—License no. 85:
Botulinus antitoxin; antianthrax serum; rabies vaccine (killed virus); bacterial vaccine made from Brucella melitensis; diphtheria toxin for Schick test; diphtheria toxoid.

Hollister-Stier Laboratories, Paulson Medical and Dental Building, Spokane, Wash.—License no. 91:
Acute anterior poliomyelitis immune serum (human); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and xerosis bacillus; pollen extracts; poison ivy extract; poison oak extract; animal epidermal extracts, vegetable food extracts.

Medical Arts Laboratory, Medical Arts Building, Oklahoma City, Okla.—License no. 98:
Rabies vaccine (killed virus).

Bureau of Laboratories, Michigan State Department of Health, Lansing, Mich.—License no. 99:
Diphtheria antitoxin; scarlet fever streptococcus antitoxin; tetanus antitoxin; antimeningococcic serum, antipneumococcic serum; smallpox vaccine; rabies vaccine (Cumming); tuberculin old; bacterial vaccines made from pertussis bacillus and typhoid bacillus; diphtheria toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization.

National Drug Co., 5109 Germantown Avenue, Philadelphia, Pa.—License no. 101:
Diphtheria antitoxin, erysipelas streptococcus antitoxin; scarlet fever streptococcus antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; immune globulin (human); normal horse serum; tuberculin old; smallpox vaccine; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts.

Mulford Colloid Laboratories, Thirty-eighth and Ludlow Streets, Philadelphia, Pa.—License no. 102:
Poison ivy extract; poison oak extract.

Allergy Laboratories, 1200 North Walker Street, Oklahoma City, Okla.—License no. 103:
Pollen extracts; vegetable food extracts; animal epidermal extracts.

Hixson Laboratories (Inc.), Johnstown, Ohio.—License no. 104:
Diphtheria antitoxin; tetanus antitoxin; antimeningococcic serum; normal horse serum; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test.

C. F. Kirk Co., Bloomfield, N. J.—License no. 105:
Bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus and typhoid bacillus; pollen extracts.

Knapp & Knapp, 224 North Olive Avenue, Burbank, Calif.—License no. 106:
Pollen extracts.

The Porro Biological Laboratories, 718 Medical Arts Building, Tacoma, Wash.—License no. 107:
Bacterial vaccines made from micrococcus catarrhalis, pneumococcus, staphylococcus aureus, and streptococcus; pollen extracts.

Central Pharmacal Co., Breslin Medical Arts Building, Louisville, Ky.—License no. 109.
Bacterial antigens made from colon bacillus, Friedländer bacillus, gonococcus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Pitman-Moore Co., Zionsville, Ind.—License no. 110:
Diphtheria antitoxin; tetanus antitoxin; antierysipeloid serum; immune globulin (human); rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Brucella melitensis, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, micrococcus tetragenus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, gonococcus, staphylococcus albus, staphylococcus aureus, streptococcus; diphtheria toxoid; tetanus toxoid; pollen extracts.

The Wm. S. Merrell Co., Cincinnati, Ohio.—License no. 111:
Bacterial vaccines made from colon bacillus, Friedländer bacillus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, typhoid bacillus; diphtheria toxoid, diphtheria toxin for Schick test.

John Wyeth and Brother, Inc., Biologic Division, Tucson, Ariz.—License no. 112:
Bacterial antigen made from streptococcus.

Michael Reese Hospital, Twenty-ninth Street and Ellis Avenue, Chicago, Ill.—License no. 113:
Acute anterior poliomyelitis immune serum (human); measles immune serum (human); scarlet fever immune serum (human); normal human serum.

The Milwaukee Serum Center, Columbia Hospital, Milwaukee, Wis.—License no. 117:
Acute anterior poliomyelitis immune serum (human); measles immune serum (human); scarlet fever immune serum (human); normal human serum.

Barry Allergy Laboratory, Michigan Theater Building, Detroit, Mich.—License no. 119:
Pollen extracts.

Biological Laboratory, Illinois Department of Health, Springfield, Ill.—License no. 120:
Rabies vaccine (killed virus); bacterial vaccine made from typhoid bacillus; diphtheria toxoid; diphtheria toxin for Schick test.

State Department of Health, Austin, Tex.—License no. 121:
Rabies vaccine (killed virus); bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, typhoid bacillus; diphtheria toxin for Schick test; diphtheria toxoid.

Turner's Clinical and X-ray Laboratories, El Paso, Tex.—License no. 122:
Rabies vaccine (killed virus).

Manhattan Convalescent Serum Laboratory, Health Research Fund, Inc., Fifteenth Street and East River, New York, N. Y.—License no. 123:
Measles immune serum (human); scarlet fever immune serum (human); normal human serum.

Childrens' Hospital Convalescent Serum Center, Los Angeles, Calif.—License no. 124:
Measles immune serum (human); acute anterior poliomyelitis immune serum (human); scarlet fever immune serum (human); normal human serum.

Hynson, Westcott and Dunning, Baltimore, Md.—License no. 125:
Snake venom solution.

Morrison Antigen Co., Missouri Theater Building, Grand and Lucas Avenues, St. Louis, Mo.—License no. 126:
Bacterial antigens made from colon bacillus, gonococcus, influenza bacillus, pertussis bacillus, pneumococcus, staphylococcus aureus, streptococcus, typhoid bacillus.

FOREIGN ESTABLISHMENTS

Institut Pasteur de Paris, 36 rue du Dr. Roux, Paris, France.—License no. 11. Selling agents for the United States, Mr. A. Charklian, Pasteur Vaccine Laboratories of France, 516 Fifth Avenue, New York, N. Y.:
Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antidysenteric serum; antiplague serum; antistreptococci serum; bacterial vaccines made from cholera vibrio, plague bacillus, staphylococcus albus, and staphylococcus aureus.

Interessen Gesellschaft Farbenindustrie Aktiengesellschaft, Hoechst am Main, Germany.—License no. 24. Selling agents for the United States, The Winthrop Chemical Co., 170 Varick Street, New York, N. Y.:
Tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from cholera vibrio, gonococcus, staphylococcus albus, staphylococcus aureus, and staphylococcus citreus; typhoid bacillus; sensitized bacterial vaccine made from typhoid bacillus; fungus extracts; arsphenamine; neoarsphenamine; sodium arsphenamine; silver arsphenamine; neosilver arsphenamine; sulpharsphenamine; sulphoxylarsphenamine.

Connaught Antitoxin Laboratory, University of Toronto, Toronto, Canada.—License no. 73:
Diphtheria antitoxin; staphylococcus antitoxin; tetanus antitoxin; diphtheria toxoid; staphylococcus toxoid.

Laboratoire de Biochimie Medicale, 19-21 rue Van-Loo, Paris, France.—License no. 83. Selling agents for the United States, Anglo-French Drug Co., 1270 Broadway, New York, N. Y., selling agents for Puerto Rico, Chas. Vere, box 216, San Juan, P. R.:
Sulpharsphenamine.

Instituto Sieroterapico Milanese, Via Darwin 20, Milan, Italy.—License no. 87. Selling agents for the United States, Italian Drugs Importing Co., 225 Lafayette Street, New York, N. Y.; selling agent for Puerto Rico, Mr. Braulio Caballero, San Juan, P. R.
Antianthrax serum; bacterial vaccines made from colon bacillus, gonococcus, pneumococcus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, and streptococcus; neoarsphenamine; acetyle-glycoarsphenamine.

Boots Pure Drug Co., Ltd., Nottingham, England.—License no. 92. Selling agents for the United States, The United Drug Co., 43 Leon Street, Boston, Mass.:
Arsphenamine diglucoside.

Sero-Bacteriological Department, Bayer-Meister-Lucius, Behringswerke, I. G. Farbenindustrie, A. G. Section, Marburg-Lahn, Germany.—License no. 97. Selling agents for the United States, The Winthrop Chemical Co., 170 Varick Street, New York, N. Y.
Diphtheria antitoxin; tetanus antitoxin; antistreptococcic serum; normal horse serum; bacterial vaccines made from colon bacillus, gonococcus, pneumococcus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Laboratoire de Bacteriophage, 75 rue Olivier de Serres, Paris, France.—License no. 108. Selling agents for the United States, Anglo-French Drug Co., 1270 Broadway, New York, N. Y.; selling agents for Puerto Rico, Mr. Joaquin Belendez, San Juan, P. R.
Bacterial antigens made from colon bacillus, dysentery bacillus, enterococcus, Friedländer bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, proteus bacillus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus.

Dr. Kade, Elisabeth Ufer 35, Berlin SO, 36, Germany.—License no. 114:
Bacterial vaccine made from colon bacillus.

La Biotherapie, 5, rue Paul-Barruel, Paris, France.—License no. 115:
Bacterial vaccines made from cholera vibrio, dysentery bacillus, paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; bacterial antigens made from pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Laboratorio Brasileiro de Chimiotherapia, Rua General Roca No. 28, Rio de Janeiro, Brazil.—License no. 116. Selling agents for the United States and Hawaii, Ernst Bischoff Co., Inc., 135 Hudson Street, New York, N. Y.; selling agents for Puerto Rico, Cesar A. Toro, Apartado 3854, Santurce, P. R.
Fungus extracts.

DEATHS DURING WEEK ENDED AUG. 14, 1937

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

	Week ended Aug. 14, 1937	Corresponding week, 1936
Data from 86 large cities in the United States:		
Total deaths	7,413	7,277
Average for 3 prior years	6,913	
Total deaths, first 32 weeks of year	287,462	288,223
Deaths under 1 year of age	545	494
Average for 3 prior years	491	
Deaths under 1 year of age, first 32 weeks of year	18,315	18,092
Data from industrial insurance companies:		
Policies in force	69,649,435	68,206,196
Number of death claims	11,290	11,456
Death claims per 1,000 policies in force, annual rate	8.5	8.8
Death claims per 1,000 policies, first 32 weeks of year, annual rate	10.3	10.4

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Aug. 21, 1937, and Aug. 22, 1936

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936
New England States:								
Maine	---	---	---	1	1	10	0	0
New Hampshire	---	---	---	---	4	10	0	0
Vermont	---	---	---	---	1	7	0	0
Massachusetts	3	2	---	---	27	46	1	1
Rhode Island	---	1	---	---	---	3	0	0
Connecticut	7	---	1	---	9	10	0	0
Middle Atlantic States:								
New York	19	18	[1] 1	(1)	127	96	7	3
New Jersey	5	10	4	6	36	44	0	1
Pennsylvania	14	18	---	---	97	39	8	5
East North Central States:								
Ohio	8	9	5	6	117	7	0	3
Indiana	3	10	---	7	11	4	1	2
Illinois	17	21	4	4	64	11	3	3
Michigan	10	6	1	1	36	8	1	0
Wisconsin	2	1	15	7	37	20	0	0
West North Central States:								
Minnesota	1	1	2	---	2	---	2	2
Iowa	1	2	---	---	5	---	0	3
Missouri	17	2	46	8	31	2	0	1
North Dakota	5	---	1	---	---	---	0	0
South Dakota	1	---	---	---	---	---	0	0
Nebraska	1	3	---	---	1	3	1	0
Kansas	3	5	1	---	5	5	2	2
South Atlantic States:								
Delaware	---	---	---	---	---	1	0	0
Maryland [2] [3]	5	5	---	---	3	11	3	3
District of Columbia	3	2	---	---	5	3	3	1
Virginia [3]	17	9	---	---	1	19	3	1
West Virginia [3]	5	10	9	---	8	5	4	0
North Carolina [3] [4]	23	18	---	---	27	4	3	3
South Carolina [4]	5	5	50	39	5	2	0	0
Georgia [4]	30	22	---	---	---	---	0	2
Florida [4]	5	3	---	---	10	11	2	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Aug. 21, 1937, and Aug. 22, 1936—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936
East South Central States:								
Kentucky	8	7	3	----	22	4	2	1
Tennessee [4]	13	24	4	8	24	1	1	1
Alabama [4]	13	15	2	4	5	----	2	0
Mississippi [3 4]	9	16	----	----	----	----	1	0
West South Central States:								
Arkansas	8	4	2	1	6	----	0	0
Louisiana	10	9	11	22	----	2	2	3
Oklahoma [4]	2	10	1	6	1	----	2	0
Texas [4]	36	25	45	28	51	26	4	1
Mountain States:								
Montana [3]	2	----	----	----	13	----	2	0
Idaho	2	----	3	1	1	3	0	0
Wyoming	----	1	----	----	2	----	0	0
Colorado	2	2	----	----	6	2	0	4
New Mexico	3	6	----	----	35	6	0	0
Arizona	1	2	5	7	----	5	1	0
Utah [2 3]	1	2	----	----	8	1	0	0
Pacific States:								
Washington [3]	1	2	----	----	11	13	----	0
Oregon [3]	1	1	13	3	1	5	0	1
California	19	19	9	12	23	49	6	2
Total	341	328	238	171	879	498	67	51
First 33 weeks of year	13,743	14,740	274,499	140,092	241,144	267,339	4,187	5,879

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936
New England States:								
Maine	6	0	4	5	0	0	0	2
New Hampshire	1	0	1	----	0	0	0	1
Vermont	3	0	3	----	0	0	1	0
Massachusetts	41	2	25	34	0	0	1	3
Rhode Island	0	0	2	4	0	0	1	0
Connecticut	6	1	7	3	0	0	2	1
Middle Atlantic States:								
New York	39	11	92	86	0	0	25	22
New Jersey	14	1	12	18	0	0	9	10
Pennsylvania	21	1	53	84	0	0	23	37
East North Central States:								
Ohio	22	8	62	48	1	0	51	13
Indiana	12	1	11	20	6	1	4	8
Illinois	54	15	66	66	10	0	24	28
Michigan	21	3	69	46	1	2	23	6
Wisconsin	6	0	33	60	1	0	1	2
West North Central States:								
Minnesota	10	1	19	12	5	9	2	3
Iowa	7	0	15	20	2	2	5	9
Missouri	13	1	44	10	7	0	37	22
North Dakota	0	0	4	14	1	1	0	1
South Dakota	1	2	9	2	1	3	0	1
Nebraska	15	0	2	6	0	0	0	4
Kansas	13	0	12	26	0	0	4	6
South Atlantic States:								
Delaware	0	0	----	----	0	0	1	2
Maryland [2 3]	5	0	12	13	0	0	12	13
District of Columbia	3	0	2	2	0	0	3	3
Virginia [3]	1	4	10	11	0	0	17	20

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Aug. 21, 1937, and Aug. 22, 1936—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936	Week ended Aug. 21, 1937	Week ended Aug. 22, 1936
South Atlantic States—Continued.								
West Virginia [2]	5	0	11	19	0	0	21	10
North Carolina [3 4]	5	0	5	16	0	0	26	21
South Carolina [4]	0	0	-------	1	0	0	18	16
Georgia [4]	5	1	9	10	0	0	19	26
Florida [4]	3	0	3	2	0	0	4	1
East South Central States:								
Kentucky	4	5	31	4	0	0	33	56
Tennessee [4]	1	24	-------	14	0	0	62	53
Alabama [4]	2	21	8	15	0	1	14	29
Mississippi [2 4]	11	10	5	5	0	0	5	7
West South Central States:								
Arkansas	10	1	6	6	0	0	40	14
Louisiana	6	2	11	1	0	0	18	29
Oklahoma [5]	19	1	7	1	0	0	27	11
Texas [4]	51	1	32	11	0	0	78	50
Mountain States:								
Montana [2]	3	1	12	9	11	24	5	3
Idaho	0	1	-------	5	6	0	1	1
Wyoming	0	0	-------	6	0	4	0	0
Colorado	21	0	3	4	0	1	0	5
New Mexico	1	0	4	2	0	0	5	2
Arizona	0	0	2	1	0	0	4	6
Utah [2 3]	0	0	38	5	0	1	0	1
Pacific States:								
Washington [2]	3	2	4	12	0	1	2	2
Oregon [2]	3	1	8	8	7	1	3	3
California	25	11	51	57	1	0	11	8
Total	492	133	819	804	60	51	642	571
First 33 weeks of year	3,432	1,454	164,859	178,715	7,974	5,955	8,185	7,280

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended Aug. 21, 1937, 10 cases, as follows: Maryland, 2; Virginia, 2; West Virginia, 1; North Carolina, 1; Montana, 1; Utah, 1; Washington, 1; Oregon, 1.
[4] Typhus fever, week ended Aug. 21, 1937, 78 cases, as follows: North Carolina, 1; South Carolina, 3; Georgia, 35; Florida, 4; Tennessee, 1; Alabama, 17; Mississippi, 1; Texas, 16.
[5] Figures for Oklahoma for 1936 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
May 1937										
Puerto Rico	-------	23	195	675	12	-------	1	-------	-------	52
July 1937										
Illinois	11	109	31	27	1,076	1	48	486	41	61
Indiana	5	42	21	-------	588	-------	31	138	29	42
Michigan	6	64	-------	6	697	-------	16	793	8	20
Minnesota	3	7	-------	-------	23	-------	4	123	33	5
New York	37	109	-------	18	2,260	-------	34	613	0	55
Ohio	16	42	18	5	1,580	-------	103	314	5	82
Virginia	16	35	72	48	275	17	12	31	0	127
Wyoming	-------	-------	-------	-------	7	-------	3	20	0	2

Summary of monthly reports from States—Continued

May 1937

	Cases
Puerto Rico:	
Chicken pox	6
Dysentery	22
Ophthalmia neonatorum	3
Tetanus	8
Whooping cough	10

July 1937

Chicken pox:	
Illinois	475
Indiana	39
Michigan	418
Minnesota	118
New York	889
Ohio	238
Virginia	45
Wyoming	8
Colorado tick fever:	
Wyoming	4
Diarrhea and enteritis:	
Ohio (under 2 years)	27
Dysentery:	
Illinois (amoebic)	6
Illinois (bacillary)	26
Illinois (amoebic carriers)	12
Indiana (amoebic)	1
Michigan (amoebic)	1
Michigan (bacillary)	8
Minnesota (amoebic)	1
Minnesota (bacillary)	1
New York (amoebic)	4
New York (bacillary)	36
Ohio (bacillary)	16
Dysentery and diarrhea:	
Virginia	1,343
Encephalitis, epidemic or lethargic:	
Illinois	6
New York	8
Ohio	4
Virginia	2
Wyoming	1

July 1937—Continued

	Cases
German measles:	
Illinois	42
Michigan	84
New York	136
Ohio	15
Granuloma:	
Illinois	2
Lead poisoning:	
Illinois	1
Ohio	34
Lymphogranuloma:	
Illinois	7
Mumps:	
Illinois	440
Indiana	26
Michigan	358
Ohio	75
Virginia	104
Wyoming	17
Ophthalmia neonatorum:	
Illinois	4
Minnesota	1
New York	15
Ohio	60
Paratyphoid fever:	
Illinois	4
Michigan	3
Minnesota	1
New York	13
Ohio	1
Virginia	3
Puerperal septicemia:	
Ohio	2
Rabies in animals:	
Illinois	36
Indiana	46
Michigan	3
New York	5
Rocky Mountain spotted fever:	
Illinois	4
Ohio	1
Virginia	15
Wyoming	4

July 1937—Continued

	Cases
Septic sore throat:	
Illinois	4
Michigan	10
Minnesota	14
New York	50
Ohio	50
Virginia	11
Wyoming	3
Tetanus:	
Illinois	4
Michigan	5
New York	6
Ohio	7
Trachoma:	
Illinois	13
Trichinosis:	
Illinois	3
New York	12
Ohio	2
Tularaemia:	
Illinois	3
Minnesota	7
Virginia	3
Wyoming	1
Typhus fever:	
New York	4
Undulant fever:	
Illinois	9
Indiana	5
Michigan	5
Minnesota	8
New York	19
Ohio	5
Virginia	4
Vincent's infection:	
Illinois	21
Michigan	17
New York	65
Whooping cough:	
Illinois	978
Indiana	330
Michigan	853
Minnesota	462
New York	1,855
Ohio	1,367
Virginia	586
Wyoming	97

PLAGUE INFECTION IN FLEAS, SAN BERNARDINO COUNTY, CALIF.

Dr. W. M. Dickie, Director of Public Health of California, reported on August 17, 1937, that plague infection had been proved, by animal inoculation, in a pool of 78 fleas taken from 28 *beecheyi* squirrels on July 29, 1937, in the Barton Flats area of San Bernardino County.

TYPHOID FEVER OUTBREAK IN PORTSMOUTH, OHIO

Under date of August 31, Dr. J. P. Leake, of the Public Health Service, reported the occurrence of 48 cases of typhoid, with 3 deaths, in Portsmouth, Ohio, since the middle of June, or about 5 times the usual incidence. In addition, 13 cases had been reported in the county. The source of the cases had not been determined.

WEEKLY REPORTS FROM CITIES

City reports for week ended Aug. 14, 1937

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	46	13	339	280	278	4	366	108	1,218	----
Current week	75	23	13	339	325	237	6	359	83	1,232	----
Maine:											
Portland	0	----	0	0	2	0	0	0	0	11	22
New Hampshire:											
Concord	0	----	0	0	1	0	0	0	0	0	10
Nashua	0	----	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	----	0	0	0	0	0	1	0	0	4
Burlington	0	----	0	0	0	0	0	0	0	0	7
Rutland	0	----	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	----	0	8	16	6	0	9	1	20	211
Fall River	0	----	0	0	1	1	0	2	0	18	33
Springfield	0	----	0	1	1	0	0	1	0	23	43
Worcester	0	----	0	0	4	2	0	2	0	8	43
Rhode Island:											
Pawtucket	0	----	0	0	0	1	0	0	0	0	15
Providence	1	----	0	0	4	3	0	1	1	35	53
Connecticut:											
Bridgeport	0	----	0	0	1	1	0	2	1	0	26
Hartford	0	----	0	4	2	2	0	1	0	4	39
New Haven	0	----	0	4	2	0	0	1	0	2	34
New York:											
Buffalo	1	----	0	2	4	2	0	10	0	25	124
New York	11	7	2	60	57	10	0	73	18	85	1,216
Rochester	0	----	0	2	3	1	0	0	1	5	51
Syracuse	0	----	0	0	2	3	0	0	0	33	45
New Jersey:											
Camden	1	----	0	0	3	1	0	1	1	0	28
Newark	0	----	0	3	2	1	0	5	0	13	82
Trenton	0	----	0	8	0	0	0	2	1	4	27
Pennsylvania:											
Philadelphia	3	----	0	2	11	13	0	19	5	37	419
Pittsburgh	1	----	0	20	16	9	0	9	3	61	124
Reading	0	----	0	5	2	0	0	1	0	2	22
Scranton	0	----	----	1	----	0	0	----	0	2	----
Ohio:											
Cincinnati	0	----	0	2	7	5	0	8	0	30	132
Cleveland	4	----	0	33	13	23	0	9	3	44	167
Columbus	0	----	0	3	2	3	0	4	2	8	67
Toledo	0	1	1	5	2	2	0	5	0	22	63
Indiana:											
Anderson	0	----	0	4	2	1	0	0	0	2	6
Fort Wayne	0	----	0	0	1	1	0	1	0	0	22
Indianapolis	0	----	0	6	6	4	1	3	0	19	94
Muncie	0	----	0	1	1	1	0	0	0	0	13
South Bend	0	----	0	1	2	0	0	0	0	1	19
Terre Haute	0	----	0	0	0	0	0	0	0	0	20
Illinois:											
Alton	0	----	0	0	0	0	0	0	0	0	16
Chicago	6	4	3	49	23	37	0	32	3	76	646
Elgin	0	----	0	0	0	0	0	0	0	5	5
Moline	0	----	0	0	0	0	0	1	0	6	16
Springfield	0	----	0	3	0	1	0	0	0	3	14
Michigan:											
Detroit	3	----	0	29	13	14	0	21	3	80	221
Flint	0	----	0	0	3	6	0	0	6	9	21
Grand Rapids	0	----	0	10	0	1	0	0	0	31	28
Wisconsin:											
Kenosha	0	----	0	0	0	1	0	0	0	0	8
Milwaukee	0	1	1	8	0	10	0	0	0	47	82
Racine	0	----	0	0	0	3	0	0	0	0	10
Superior	0	----	0	0	0	2	0	0	0	5	8

City reports for week ended Aug. 14, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	0	5	0	1	0	10	22
Minneapolis	0	------	0	1	0	4	0	1	0	8	85
St. Paul	0	------	0	0	2	1	0	2	0	40	52
Iowa:											
Cedar Rapids	0	------	--------	1	-------	0	0	-------	0	1	--------
Davenport	0	------	--------	0	-------	0	0	-------	0	0	--------
Des Moines	0	------	--------	0	-------	1	0	-------	0	0	31
Sioux City	0	------	--------	0	-------	0	0	-------	0	2	--------
Waterloo	0	------	--------	1	-------	0	0	-------	1	2	--------
Missouri:											
Kansas City	0	------	0	1	3	3	0	2	1	2	83
St. Joseph	2	------	0	0	2	3	1	2	0	0	34
St. Louis	3	------	0	10	8	7	1	10	5	22	189
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	13	6
Grand Forks	0	------	--------	1	-------	0	0	-------	0	0	--------
Minot	0	------	0	1	0	0	0	0	0	0	5
South Dakota:											
Aberdeen	0	------	--------	0	-------	0	0	-------	0	2	--------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	6
Nebraska:											
Omaha	0	------	0	1	0	0	0	2	0	2	57
Kansas:											
Lawrence	0	------	0	1	0	0	0	0	0	1	5
Topeka	0	------	0	0	4	0	0	0	0	20	24
Wichita	0	1	1	1	2	1	0	1	0	10	35
Delaware:											
Wilmington	0	------	0	0	2	0	0	1	0	1	34
Maryland:											
Baltimore	2	------	1	1	12	5	0	18	3	70	202
Cumberland	0	------	0	0	0	0	0	0	0	2	12
Frederick	0	------	0	0	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	6	------	0	6	6	4	0	8	6	7	142
Virginia:											
Lynchburg	1	------	0	1	1	0	0	0	0	2	14
Richmond	0	------	0	3	0	0	0	1	0	1	46
Roanoke	0	------	0	0	0	2	0	0	0	0	7
West Virginia:											
Charleston	0	------	0	0	6	0	0	2	1	0	42
Huntington	0	------	--------	0	-------	0	0	-------	0	0	--------
Wheeling	0	------	1	0	0	1	0	1	1	10	21
North Carolina:											
Raleigh	0	------	0	0	0	0	0	0	1	2	12
Wilmington	0	------	0	0	0	0	0	0	1	9	8
Winston-Salem	0	------	0	1	1	0	0	1	0	8	11
South Carolina:											
Charleston	0	5	0	0	2	2	0	0	1	2	13
Florence	1	------	0	0	0	0	0	3	1	0	11
Greenville	0	------	0	0	1	1	0	0	0	1	11
Georgia:											
Atlanta	2	------	0	0	4	2	0	0	0	19	88
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	0	1	0	0	1	0	0	4	1	5	33
Florida:											
Miami	1	------	0	4	0	0	0	1	1	0	35
Tampa	1	------	0	0	1	1	0	1	0	3	21
Kentucky:											
Covington	0	------	0	1	2	0	0	0	0	11	23
Lexington	0	------	0	0	1	0	0	1	0	0	21
Louisville	1	------	0	14	3	9	0	1	0	43	55
Tennessee:											
Knoxville	0	------	0	0	2	2	0	2	2	1	32
Memphis	4	------	1	9	0	1	0	8	1	14	77
Nashville	0	------	1	0	0	0	0	3	1	7	53
Alabama:											
Birmingham	2	------	0	1	3	0	0	1	0	2	61
Mobile	0	------	0	0	0	0	0	0	0	0	24
Montgomery	0	------	--------	0	-------	0	0	-------	0	0	--------

City reports for week ended Aug. 14, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	1			0		0	0		0	0	
Little Rock	1		0	1	5	1	0	3	0	3	11
Louisiana:											
Lake Charles	0			0		0	0		0	0	1
New Orleans	7		0	0	9	1	0	13	1	9	141
Shreveport	0		0	0	2	0	0	4	0	0	38
Oklahoma:											
Muskogee	0		0	0	0	1	0	0	0	0	5
Oklahoma City	0		0	0	3	1	0	0	1	0	52
Tulsa	3			1		0	0		0	5	
Texas:											
Dallas	3		0	1	0	1	0	2	1	7	52
Fort Worth	0		0	0	1	1	0	0	2	8	50
Galveston	0		0	0	1	0	0	0	0	0	11
Houston	2		0	0	6	2	0	2	1	0	81
San Antonio	1		0	0	3	1	0	9	1	0	48
Montana:											
Billings	0		0	0	0	0	0	0	0	2	8
Great Falls	0		0	0	0	0	0	1	0	2	10
Helena	0		0	0	0	1	0	0	0	0	2
Missoula	0		0	0	0	1	0	0	0	0	2
Idaho:											
Boise	0		0	0	1	0	1	0	0	0	4
Colorado:											
Colorado Springs	0		0	0	1	0	0	1	0	0	13
Denver	1		1	14	3	2	0	4	1	14	76
Pueblo	0		0	0	1	0	0	2	0	0	13
New Mexico:											
Albuquerque	0		0	0	0	1	0	1	0	1	12
Utah:											
Salt Lake City	0		0	16	3	4	0	0	1	2	35
Washington:											
Seattle	0		0	2	0	0	0	2	0	28	82
Spokane	0	1	1	2	1	0	0	2	0	11	29
Tacoma	0		0	0	2	0	0	0	0	0	22
Oregon:											
Portland	6		0	1	0	2	0	2	1	1	75
Salem	0	1		1		0	0		0	0	
California:											
Los Angeles	4	2	0	2	13	9	2	15	4	82	274
Sacramento	2	1	0	1	3	2	0	2	1	3	37
San Francisco	0		0	1	7	4	0	10	0	39	154

City reports for week ended Aug. 14, 1937—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Maine:			
Portland	0	0	4
Massachusetts:			
Boston	0	0	8
Fall River	0	0	[1] 1
Springfield	2	1	0
Worcester	0	0	3
Rhode Island:			
Providence	0	0	1
New York:			
Buffalo	1	1	1
New York	2	1	8
Syracuse	0	0	2
New Jersey:			
Newark	1	0	2
Pennsylvania:			
Philadelphia	2	1	4
Ohio:			
Cincinnati	1	1	5
Cleveland	0	0	5
Columbus	0	0	5
Toledo	0	0	1
Indiana:			
Indianapolis	0	0	3
Muncie	0	0	1
South Bend	0	0	1
Illinois:			
Alton	1	0	0
Chicago	0	0	21
Michigan:			
Detroit	0	0	13
Grand Rapids	0	0	1
Wisconsin:			
Milwaukee	0	0	6
Minnesota:			
Duluth	0	0	1
Minneapolis	0	0	2
Iowa:			
Des Moines	0	0	2
Sioux City	0	0	2
Missouri:			
Kansas City	0	0	8
St. Joseph	0	1	0
Nebraska:			
Omaha	0	0	14
Maryland:			
Baltimore	0	0	6
District of Columbia:			
Washington	0	0	1
West Virginia:			
Charleston	2	1	0
Kentucky:			
Louisville	0	0	1
Alabama:			
Birmingham	1	0	0
Mobile	1	1	0
Arkansas:			
Little Rock	0	0	1
Oklahoma:			
Muskogee	0	0	5
Oklahoma City	1	0	2
Tulsa	0	0	2
Texas:			
Dallas	0	0	1
Fort Worth	0	0	3
Galveston	0	0	1
Houston	1	0	5
Colorado:			
Colorado Springs	0	0	1
Denver	1	1	0
New Mexico:			
Albuquerque	0	0	1
Utah:			
Salt Lake City	0	0	1
California:			
Los Angeles	0	0	11

[1] Preparalytic.

Encephalitis, epidemic or lethargic.—Cases: Cleveland, 1; Columbus, 1; Houston 1.

Pellagra.—Cases: Chicago, 1; Baltimore, 1; Atlanta, 1; Savannah, 1; Miami, 1; Nashville, 1; Birmingham, 1; Fort Smith, 1; New Orleans, 2; Dallas, 1; San Francisco, 1.

Typhus fever.—Cases: Charleston, S. C., 1; Greenville, 1; Atlanta, 2; Savannah, 5; Miami, 1; Birmingham, 1; Montgomery, 1; Houston, 1; Deaths: Greenville, 1; Savannah, 1.

FOREIGN AND INSULAR

CUBA

Habana—Communicable diseases—4 weeks ended July 31, 1937.—During the 4 weeks ended July 31, 1937, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	12		Rabies	1	1
Malaria	[1] 19		Tuberculosis	18	1
Poliomyelitis	[1] 1	1	Typhoid fever	[1] 19	5

[1] Includes imported cases.

Habana—Communicable diseases—Fiscal year ended June 30, 1937.—During the fiscal year ended June 30, 1937, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	July-December 1936		January-June 1937		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Cerebrospinal meningitis			1		1	
Diphtheria	75	4	141	6	216	10
Dysentery (bacillary)	55	11			55	11
Epidemic encephalitis	1	1			1	1
Leprosy	5	1	4		9	1
Malaria	659	17	238	10	897	27
Measles				1		1
Poliomyelitis	23	2	24		47	2
Scarlet fever	1		13		14	
Tuberculosis	90	19	108	14	198	33
Typhoid fever	364	81	300	44	664	125

NOTE.—Imported cases are included in the above figures.

FINLAND

Communicable diseases—June 1937.—During the month of June 1937, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	223	Scarlet fever	793
Dysentery	1	Typhoid fever	49
Influenza	1,204	Typhus fever	1
Paratyphoid fever	147	Undulant fever	4
Poliomyelitis	4		

JAMAICA

Communicable diseases—4 weeks ended August 7, 1937.—During the 4 weeks ended August 7, 1937, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chicken pox		9	Leprosy		4
Diphtheria	2		Scarlet fever		2
Dysentery	3	2	Tuberculosis	32	70
Erysipelas		2	Typhoid fever	8	68

SWEDEN

Notifiable diseases—June 1937.—During the month of June 1937, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	7	Scarlet fever	1,106
Diphtheria	29	Syphilis	20
Dysentery	13	Typhoid fever	15
Gonorrhea	859	Undulant fever	14
Paratyphoid fever	28	Weil's disease	1
Poliomyelitis	[1] 75		

[1] Includes 17 cases nonparalytic at time of notification.

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

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for August 27, 1937, pages 1191-1205. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued September 24, 1937, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

Cholera

China—Hong Kong.—During the week ended August 7, 1937, 21 cases of cholera, with 19 deaths, were reported in Hong Kong, China.

India—Northwest Frontier Province.—During the week ended August 14, 1937, 100 cases of cholera were reported in the Northwest Frontier Province, India.

Plague

China—Manchuria.—Information dated August 18, 1937, states that an outbreak of plague is reported from West Hsingan (Khingan) and Southern Lungkiang Provinces, Manchuria.

Hawaii Territory—Island of Hawaii—Hamakua District—Hamakua Mill Co. Sector.—Five rats found during the period August 10–12, 1937, in Hamakua Mill Co. Sector, Hamakua district, island of Hawaii, Hawaii Territory, have been proved plague infected.

United States—California.—A report of plague infection in fleas in San Bernardino County, Calif., appears on page 1241 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Mexico.—During the month of May 1937, smallpox has been reported in Mexico as follows: Aguascalientes, Aguascalientes State, 1 case; Ciudad Juarez, Chihuahua State, 2 cases, 1 death; Mexico, D. F., 41 cases, 8 deaths; Queretaro, Queretaro State, 10 cases, 5 deaths; Toluca, Mexico State, 1 case. During the month of June 1937, 15 deaths from smallpox were reported in Mexico, D. F.

Typhus Fever

Mexico.—During the month of May 1937, typhus fever was reported in Mexico as follows: Aguascalientes, Aguascalientes State, 2 cases; Guanajuato, Guanajuato State, 4 cases, 1 death; Mexico, D. F., 14 cases, 3 deaths; Pachuca, Hidalgo State, 1 case, 1 death; Queretaro, Queretaro State, 2 cases, 2 deaths; San Luis Potosi, San Luis Potosi State, 2 cases, 1 death; Toluca, Mexico State, 2 cases. During the month of June 1937, five deaths from typhus fever were reported in Mexico, D. F.

Yellow Fever

Brazil—Para State.—Yellow fever has been reported in Para State, Brazil, as follows: Bemfica, June 28, 1 death; Cameta, July 1, 1 death.

Colombia.—Yellow fever has been reported in Colombia as follows: Muzo, Boyaca Department, June 14, 1 case, June 30, 1 case; Yacopi, Cundinamarca Department, June 16, 1 death; Rionegro, Santander Department, June 30, 1 death.

Gold Coast.—On August 13, 1937, one case of yellow fever was reported in Adeiso, and one case in Nuaso, Gold Coast.

Ivory Coast—Agboville.—On August 11, 1937, one case of yellow fever was reported in Agboville, Ivory Coast.

Nigeria.—On August 13, 1937, three cases of yellow fever were reported in Nigeria, no location being given.

Senegal—Tamba-Counda.—On August 16, 1937, one suspected case of yellow fever was reported in Tamba-Counda, Senegal.