Public Health Reports

Vol. 60 • DECEMBER 14, 1945 • *No. 50*

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

APPARENT SEROLOGICAL HETEROGENEITY AMONG STRAINS OF TSUTSUGAMUSHI DISEASE (SCRUB TYPHUS)[1]

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Evidence of several different kinds indicates that a considerable degree of heterogeneity exists among strains of tsutsugamushi disease (scrub typhus) in contrast to the very uniform behavior of exanthematic (epidemic) and murine (endemic) strains of typhus fever. Differences in virulence have been found in laboratory animals. Of the five strains studied, Karp, Gilliam, Seerangayee, case 9 and Imphal,[2] the first four are more virulent for guinea pigs than is the Imphal strain. The Seerangayee strain is the most virulent, followed by the Gilliam and Karp strains. The Karp strain is usually more virulent for mice than the Gilliam strain as indicated by the higher titers and the greater regularity in the number of deaths of the mice in relation to the size of the dose, when graded dilutions of infected yolk-sac material are used as inocula. In the chick embryo the Karp, Seerangayee, and case 9 strains cause death of the embryo 9 to 12 days after inoculation into the yolk of infected yolk sac. This period may sometimes be reduced to 7 or 8 days. The Gilliam strain in contrast to the others causes death of the embryo earlier and sometimes kills in as short a time as 4 or 5 days. In general the Gilliam strain can be cultivated in the chick embryo more readily than the other strains. The complement-fixing response in the serum of guinea pigs inoculated with the Gilliam strain is greater than with other strains and higher titered serums are obtained. The Imphal strain is the least virulent of any of the strains. The incubation period in the egg is too long to allow the infection to develop sufficiently to kill the embryo before 21 days.

Differences in the virulence of the disease among humans as well

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

[2] The Karp strain from a New Guinea case of tsutsugamushi and the Seerangayee strain from Malaya were furnished to the National Institute of Health through the courtesy of Dr. R. Lewthwaite; the Gilliam strain was from the case of Dr. A. G. Gilliam at the Assam-Burma border; case 9 strain was from a case on New Guinea; and the Imphal strain came from India.

as among animals have been observed and commented upon by observers in the field. In certain localities a virulent type of disease with a high mortality occurs while in other regions symptoms of the disease are milder and the death rate is comparatively low.

Since reporting on a complement-fixation test for tsutsugamushi disease (scrub typhus) (*1*) in which the Karp strain was used in the preparation of antigen, further studies have been made in which the Gilliam strain as well as the Seerangayee and case 9 strains have been used as antigens.

The present study is designed to call attention to the lack of serological homogeneity among different strains of tsutsugamushi disease, particularly the Karp and Gilliam strains. The most accurate information regarding the relationship of strains can probably be obtained from a study of antiserums resulting from infection with known strains of virus. Therefore, in this study, the results obtained with serums from recovered guinea pigs employed in the passage of the various strains of the tsutsugamushi disease at the National Institute of Health and serums from cases of accidental laboratory infections are considered. The latter group of serums was from five different cases, three of which were infected with the Karp strain and two with the Gilliam strain.

THE COMPLEMENT-FIXATION TEST

The complement-fixation test employed in the serological study was performed as previously described (*2*). The reagents were used in 0.2-cc. amounts except the sensitized cells, 0.4 cc. of which was added. Two full units of complement were employed and fixation was carried out at 37° C.

PREPARATION OF ANTIGENS

Antigens were prepared from infected yolk sacs. Various methods of preparation have been tried, but the one found to give the most satisfactory results at the present stage has been one in which not too much effort has been made to obtain a highly purified product. A 33⅓-percent suspension of infected yolk sac containing numerous rickettsiae was made with 0.85-percent saline or with distilled water formalinized so that the final concentration of formalin was 0.1-percent. After grinding in a Waring blendor and standing overnight, the suspension was treated with one part of anhydrous diethyl ether and immediately centrifuged until a relatively clear layer of fluid separated between an upper layer of tissue and a precipitate of heavier particles in the bottom of the container. The fluid layer was siphoned or pipetted off and subjected to a further light centrifugation to remove any material which might be precipitated or rise to the surface. If this centrifugation is continued too long or if the ether

treatment is too prolonged, there is a certain amount of loss of antigenicity. It seems probable that there is also a gradual loss of antigenicity on storage of the antigen at refrigerator temperature. Tests for specificity have been made with epidemic and endemic typhus, Rocky Mountain spotted fever, lymphogranuloma venereum, psittacosis, and 100 syphilis serums. Negative results were obtained except in low dilutions with a few lymphogranuloma serums tested against the Gilliam antigen. Further slight centrifugation of the antigen removed the nonspecific substances.

STANDARDIZATION OF THE REAGENTS

Control lyophilized serums from recovered guinea pigs were employed regularly in all tests. All new antigens were tested against the control serums and when new control serums were prepared these were tested against an antigen which has been in use. Cross titrations using varying dilutions of control guinea pig serums beginning with one-fourth dilutions against varying amounts of antigen beginning with undiluted antigen have been made for the purpose of obtaining information as to the dose of antigen to be used in the testing of serums of unknown titer. Usually it was found that the Gilliam guinea pig antiserums were of relatively high titer while Gilliam antigens were of lower titer than Karp antigens. Karp guinea pig antiserums were of lower titer than the Gilliam antiserums (table 1).

TABLE 1.—*Titration of Karp and Gilliam antiserums against their homologous antigens*

KARP ANTISERUM

Karp antigen	Dilutions							
	¼	⅛	1/16	1/32	1/64	1/128	1/256	1/512
Undiluted	4	4	4	4	4	4	2	0
Diluted:								
½	4	4	4	4	4	4	1	0
¼	4	4	4	4	4	4	Trace	0
⅛	4	4	4	4	4	4−	0	0
1/16	4	4	4	4	4	2	0	0
1/32	4	4	4	2	2	0	0	0
1/64	4	3	Trace	Trace	0	0	0	0
1/128	4−	Trace	0	0	0	0	0	0

GILLIAM ANTISERUM

Gilliam antigen	Dilutions									
	¼	⅛	1/16	1/32	1/64	1/128	1/256	1/512	1/1024	1/2048
Undiluted	4	4	4	4	4	4	4	4	4	Trace
Diluted:										
½	4	4	4	4	4	4	4	4	4	0
¼	4	4	4	4	4	4	4	4	4	0
⅛	4	4	4	4−	4−	1	4	4	4	0
1/16	4−	4−	2	1	0	0	0	0	0	0
1/32	1−	Trace	0	0	0	0	0	0	0	0
1/64	0	0	0	0	0	0	0	0	0	0
1/128	0	0	0	0	0	0	0	0	0	0

In order to obtain fixation with serums which might be low titered, e. g., serums containing only enough antibody to correspond with that contained in a 1/128 dilution of the Karp control serum or 1/1024 of the Gilliam control serum, the unit of antigen is placed at four times the dilution of antigen-giving fixation with the higher dilutions of control serum. In both of the above titrations the amount of antigen to be used would therefore be a one-half dilution. Lower titered antigens were used undiluted.

RESULTS WITH RECOVERED GUINEA PIG SERUMS

Graded dilutions of recovered guinea pig serums were tested against undiluted antigens and antigens diluted one-half. In all cases higher titers were obtained with the homologous strain. There was cross fixation among all strains and this was often directly proportional to the titer of the serum against the homologous strain (table 2).

TABLE 2.—*Titration of guinea pig antiserums against homologous and heterologous antigens*

Serum	Antigen	Titer
Karp (KS2)	Karp K122: Undiluted	1/256
	Diluted ½	1/256
	Gilliam G121: Undiluted	¼
	Diluted ½	¼
	Seerangayee S118: Undiluted	1/16
	Diluted ½	1/16
Gilliam (GS2)	Gilliam G121: Undiluted	1/2048
	Diluted ½	1/1024
	Karp K122: Undiluted	1/16
	Diluted ½	¼
	Seerangayee S118: Undiluted	1/32
	Diluted ½	¼
Seerangayee (SS1)	Seerangayee S118: Undiluted	1/128
	Diluted ½	1/128
	Karp K122: Undiluted	1/32
	Diluted ½	1/32
	Gilliam G121: Undiluted	1/32
	Diluted ½	1/32

In two other series of tests similar results were obtained (table 3).

TABLE 3.—*Titration of guinea pig antiserums against homologous and heterologous antigens*

Serum	Antigen	Titer
Series 1		
Karp KS1	Karp K90	1/256
	Gilliam Va8	1/32
	Seerangayee	1/16
Gilliam GS1	Gilliam Va8	1/4096
	Karp K90	1/64
	Seerangayee 101	1/16
Seerangayee SS1	Seerangayee	1/4096
	Karp K90	1/128
	Gilliam Va8	1/32
Series 2		
Case 9	Case 9 C58	1/2048
	Karp K23	1/128
	Gilliam G47	1/32
Gilliam	Gilliam G47	1/8192
	Karp K23	1/64
	Case 9 C58	1/8
Karp	Karp K23	1/512
	Gilliam G47	1/16
	Case 9 C58	1/128

RESULTS WITH SERUMS FROM LABORATORY INFECTIONS

Of the five cases of accidental laboratory infection from whom serums were obtained, two were infected with a hypodermic syringe needle and the strain was definitely known. The exact mode of infection of the other three is not known, but two of these patients had handled the Gilliam strain almost exclusively and the other one was presumably working with the Karp strain. The complement fixation test differentiates sharply between the two strains (table 4).

TABLE 4.—*Complement fixation results with serums from five cases of tsutsugamushi disease (scrub typhus)*

Case No.	Infecting strain	Sex	Specimen No.	Days after onset	Complement-fixation titer	
					Karp strain	Gilliam strain
1	Karp	M	10319	4	0	0
			10320	12	1/512	0
2	Gilliam	M	10342	4	0	0
			10343	8	1/16	1/32
			10344	12	1/64	1/65536
			10422	18	1/64	1/65536
3	do	M	10345	3	0	0
			10346	9	0	1/4
			10347	12	0	1/512
			10369	16	1/128	1/131072
			10423	19	1/128	1/262144
			10494	46	1/128	1/65536
			10503	49	1/64	1/65536
			11369	[1] 10	0	1/128
4	Karp	M	11351	1	0	0
			11352	6	1/8	0
			11353	11	1/1024	0
			11354	15	1/2048	1/8
			11355	24	1/2048	1/8
			11356	31	1/4096	1/8
5	do	F	11307	2	0	0
			11296	11	1/1024	0

[1] Months.

DISCUSSION

The present investigation suggests the occurrence of serological variations among strains of tsutsugamushi. All of the strains studied have common antigenic factors, but they fix complement in markedly higher dilutions with their homologous serums than with heterologous serums. The clear differentiation between the Karp and Gilliam strains, particularly in the complement-fixation tests of serums from cases of the human disease resulting from infection with known strains, point to the existence of at least two serological variants. In view of the low titers obtained with the heterologous strain it would appear advisable, as a disagnostic procedure, to employ both antigens in the testing of serums from suspected cases of the disease. Further detailed studies will be necessary to determine more accurately the relationship of the various strains and whether possibly other strains should also be included as test antigens in addition to the Karp and Gilliam strains. Incidentally, in this connection several groups of serums from cases of the disease occurring in different theaters of the Pacific

war area have been tested and all have yielded positive fixation against the Karp or Gilliam antigens.

Further purification, concentration, and standardization of the antigen is desirable, though the question of purification is apparently complicated by a certain instability of the antigenic substance and standardization by the relatively low potency of the antigens. However, with the antigens prepared as described, apparently conclusive results have been obtained in determining the presence of antibody and in differentiating strains. It is a question whether these results may be modified by further purification of the antigen.

The relationship of serological types to immunogenicity deserves further study. Topping (*3*) has shown that cross immunity exists in guinea pigs among the four strains studied: Karp, Gilliam, Seerangayee, and case 9. It remains to be determined whether a strain which fixes complement in higher dilutions than another also brings about a higher degree of immunity.

SUMMARY

Serums from guinea pigs inoculated with different strains of tsutsugamushi disease (scrub typhus) and serums from five cases of the disease accidentally infected with known strains when tested by complement fixation yielded markedly higher titers with the homologous strain than with heterologous strains. Infections with the Karp and Gilliam strains were clearly differentiated and therefore it is desirable that both antigens be employed in testing serums from cases of suspected illness.

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AN EPIDEMIC OF A SEVERE PNEUMONITIS IN THE BAYOU REGION OF LOUISIANA[1]

V. ETIOLOGY

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An outbreak of severe pneumonitis occurred in the bayou region of southwestern Louisiana during the winter and spring of 1943–44. Nineteen known cases, eight of which terminated fatally, developed during the course of the outbreak. Epidemiological, clinical, and pathological studies were made jointly by the Louisiana State Board

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

of Health and the United States Public Health Service (*1*, *2*, *3*, *4*). The results of these studies indicated the infectious nature and mode of spread, and defined the clinical and pathological characteristics of the disease in humans. This paper deals with the etiology of the disease.

METHOD OF STUDY

The initial study of cases was made by taking mice, guinea pigs, and monkeys to homes where the cases occurred and inoculating them with sputum or blood obtained directly from the patient. These animals were taken to an isolated laboratory building at the United States Marine Hospital in New Orleans for observation. Further materials were studied subsequently in both the New Orleans laboratory and at the National Institute of Health in Bethesda, Md.

COLLECTION OF MATERIAL

Ante mortem.—Sputum or throat washings were collected in sterile bottles. Portions of the specimens were inoculated directly into animals in most instances, while other portions were refrigerated. Some of the specimens were diluted with 30 percent glycerine. Whole blood was injected immediately into animals, and blood for transport to the laboratory was citrated and refrigerated in transit.

Post mortem.—Tissues from cases 17 and 18 were obtained at autopsy.

BACTERIOLOGICAL STUDIES

The autopsy material offered the best opportunity for detailed bacteriological studies. Specimens of liver, spleen, ascitic fluid, pleural fluid, brain, and pneumonic areas of the lung were cultured on blood agar plates and in thioglycollate broth. No pathogenic bacteria were isolated.

ISOLATION OF VIRUS

The virus was isolated from throat washings, sputum, and blood obtained from three patients during the course of illness and from autopsy material obtained from two fatal cases. The isolations were made in mice and guinea pigs in the New Orleans laboratory and in mice at the National Institute of Health laboratory. The material from which isolations were made, the methods of inoculation of the animals, and results obtained are given in table 1. As seen in this table, isolations were readily accomplished from throat washings, sputum, blood, and from autopsy specimens of lung and spleen. Typical examples of isolations from each type of material serve to illustrate the procedures used.

Throat washings from case 17 taken on the third day of illness were given intranasally to three mice on March 10, 1943. The mice died

TABLE 1.—*Isolation of virus responsible for an outbreak of Louisiana pneumonitis, showing materials and methods of inoculation*

Case No.	Material used as inoculum	Day of disease material was obtained	Isolations of virus in mice and guinea pigs		
			New Orleans laboratory		National Institute of Health
			Isolations in mice	Isolations in guinea pigs	Isolations in mice
16	Throat washings.	Ninth	+ intraperitoneal		
17	Throat washings.	Third	+ intranasal		
17	Sputum	Sixth	+ intranasal		+ intraperitoneal, intracerebral.
17	Blood	Sixth		+ intraperitoneal	
17	Lung	Autopsy	+ intraperitoneal, intracerebral, and intranasal.	+ intraperitoneal	+ intraperitoneal.
17	Spleen	Autopsy	+ intraperitoneal, intracerebral, and intranasal.	+ intraperitoneal	
18	Throat washings.	Sixth	+ intranasal		
18	Lung	Autopsy	+ intraperitoneal	+ intraperitoneal	+ intraperitoneal.

within 6 days with an extensive pneumonitis. The agent was readily transmitted in series by either intranasal or intraperitoneal inoculation of tissue suspensions into mice.

Blood taken from case 17 on the sixth day of illness was citrated and injected intraperitoneally into one guinea pig. Death of the guinea pig occurred on the twelfth day following injection. Lung tissue obtained at autopsy from case 17 was made into a 10-percent suspension in salt solution and was inoculated intraperitoneally in 0.5-cc. amounts into five mice. Death of all animals occurred in 5 to 6 days. Intranasal inoculation of the same material into five mice produced death in 7 to 10 days and intracerebral injection of this suspension into five mice produced death in 5 to 6 days. Three guinea pigs were inoculated intraperitoneally with 5-cc. portions of this suspension; two died on the seventh day and the third on the eleventh day.

A specimen of sputum preserved in 30-percent glycerin from case 17 which was sent to the National Institute of Health was given to three lots of six mice each by intranasal, intracerebral, and intraperitoneal routes, using doses of 0.03-, 0.03-, and 0.3-cc. quantities for the respective routes. None of the mice inoculated by the intranasal method became ill, although a portion of this sample of sputum to which no glycerin had been added produced death in mice inoculated intranasally at the field laboratory. Two mice given material intracerebrally were ill on the third day. These were killed, the brains removed, made into a 10-percent suspension in normal salt solution, and inoculated intraperitoneally into groups of six mice each in 0.3-cc. amounts. All mice subsequently died. On the seventh day

following inoculation, two of the mice which received glycerinated sputum intraperitoneally were ill. These were killed, and as the presence of viscous, mucoid fluid in the peritoneal cavity and flecks of fibrin suspended in this fluid was suggestive of psittacosis a search was made for elementary bodies. Elementary bodies characteristic of the lymphogranuloma-psittacosis group of virus were demonstrated in the tissues with Machiavello's stain. Animals inoculated intraperitoneally with tissues from these mice died and elementary bodies were easily demonstrated in the spleen and liver. On the eighth day following intraperitoneal inoculation with sputum, two other mice became ill, and were killed. They presented lesions similar to those noted above and elementary bodies were found in the liver and spleen.

A 10-percent suspension of human lung tissue which had been frozen in CO_2 in 0.85-percent salt solution was prepared and doses of 0.3 cc. administered to eight mice intraperitoneally. Two mice were moribund on the fifth day following infection and at autopsy presented enlargement of the spleen and a fibrinous exudate in the peritoneal cavity. Elementary bodies were noted when smears of the spleen and liver were examined. On the sixth day following injection of the human tissue one mouse was dead and two others comatose. These presented typical lesions and the liver and spleen of one of these was used to inoculate three groups of eight mice each by intraperitoneal, intracerebral, and intranasal routes, respectively. Death of all mice occurred within 3 to 4 days. Typical pneumonic lesions were produced by intranasal inoculation. Similar results were obtained from another specimen of lung tissue of the same patient and from lung tissue of case 17.

In all strains isolated from human lung tissues, tests to determine the susceptibility of mice by various routes of injection were instituted on the first mouse passage following isolation. The results are given in table 2 and show that mice are extremely susceptible to infection by the routes of injection employed.

It should be emphasized that during the months previous to this study, large numbers of animals from the colony maintained at the National Institute of Health had been subjected to close scrutiny during the course of certain studies concerning the etiology of pneumonitis and in no instance were lesions similar to those produced by the present agent observed nor were elementary bodies demonstrated in tissues stained with Machiavello's stain. No studies of viruses of any type were being carried on in the field laboratory used in New Orleans and all animals inoculated and studied with the new strain of virus were maintained in a separate isolated building. All other animals used in the study after isolation of virus had been accomplished were purchased from commercial sources in various areas or were raised at the National Institute of Health.

TABLE 2.—*The effect produced in mice by intraperitoneal, intracerebral, and intranasal inoculation of 0.3-cc, 0.03-cc, and 0.03-cc, quantities, respectively, of 10-percent tissue suspensions from mice dying during original passage of virus from human lung tissue*

Source of virus	Original isolation of virus in mice		Susceptibility of mice inoculated by various routes with tissue from previous mice			
	Date inoculated	Date moribund	Date inoculated	Days to death (by route of inoculation)		
				Intraperitoneal	Intracerebral	Intranasal
	1943	*1943*	*1943*	*Days to death*	*Days to death*	*Days to death*
Case 17	Mar. 27	Apr. 2	Apr. 2	3 to 4	3 to 4	3
Case 18	Mar. 27	Apr. 2	Apr. 2	3 to 4	3 to 4	3
Case 18	Mar. 27	Apr. 2	Apr. 2	3 to 4	3 to 4	3 to 4

EXPERIMENTAL

DISEASE PRODUCED IN MICE BY INOCULATION OF THE VIRUS

Experimental studies were made with three strains of virus. Two were isolated from case 17, one from throat washings, the other from lung tissue. The other strain originated from lung tissue of case 18.

The symptoms produced in mice did not differ to any great extent from those observed in animals suffering from infections with psittacosis or meningopneumonitis virus. When injected intraperitoneally with infective material, mice usually died in from 3 to 5 days, although some succumbed as early as the second day and others as late as the eleventh or twelfth day after administration of virus. The first symptoms were usually noted in 48 to 72 hours. The mice were listless and apathetic and the fur was ruffled. As the disease progressed a considerable amount of exudate appeared about the eyes and in many cases was sufficient to cause the lids to adhere to each other. Respirations were rapid and labored. Weakness of the hind legs was observed to such a degree as to constitute an ataxic and at times a paralyzed state. Many animals went into a deep coma and died quietly, while others developed a convulsion just prior to death.

Gross pathological lesions closely resembled those observed in infections produced by other agents in this group. During the early passages in mice a considerable number of flecks of fibrin were observed in the peritoneal cavity but in later passages these decreased and eventually disappeared. A moderate amount of a clear, viscous, stringy fluid was present in the peritoneal cavity. The exudate was tenacious and would string out when touched with an instrument. The spleen was enlarged, but displayed no discrete lesions. The serous membranes were glistening. The lymph nodes were not enlarged and the thoracic viscera were not modified except for occasional animals showing areas of pneumonitis.

Elementary bodies were readily demonstrable in the spleens and

less easily in the livers of mice dying following intraperitoneal inoculation of virus. They stained well with Machiavello's stain. The elementary bodies stain red by this method and the cells stain blue. The bodies were noted in the cytoplasm of mononuclear and polymorphonuclear cells, tissue cells, and in many instances were found outside the boundaries of cells. The number of bodies observed in any cell varied considerably, only a few being present in some instances while in others a sufficient number were present to distend the cells or were found lying free in large numbers. The bodies were also detected in smears of brain, meninges, or lungs of mice inoculated intracranially or intranasally with virus.

Titrations of virus in mice.—Titrations of the infectivity of this agent for mice when administered intracerebrally or intraperitoneally were made. Tenfold serial dilutions of tissue emulsions were made in 0.85-percent salt solution and the same suspension was used to inoculate mice by both methods.

The initial titration was made with a strain of virus which was in its second mouse passage and had been isolated from case 17. Liver and spleen from a moribund mouse were ground and suspended in 0.85-percent salt solution to make a 10-percent tissue suspension. Groups of seven mice each were given 0.03 cc. of each dilution intracerebrally under ether anesthesia and similar groups of mice were given 0.5 cc. of each dilution intraperitoneally. The mice were observed for 2 weeks. The results, given in table 3, show the ability of the virus to kill mice to the same titer when administered by either route. Similar results were obtained in other tests.

TABLE 3.—*Comparison of infectivity of virus for mice by intraperitoneal and intracerebral routes using serial tenfold dilutions of liver and spleen suspension from a mouse infected with second mouse passage virus of Louisiana pneumonitis*

Dilution of tissue suspension	Intraperitoneal inoculation		Intracerebral inoculation		Dilution of tissue suspension	Intraperitoneal inoculation		Intracerebral inoculation	
	Dose, cc.	Number of mice dying [1]	Dose, cc.	Number of mice dying [1]		Dose, cc.	Number of mice dying [1]	Dose, cc.	Number of mice dying [1]
10^{-1}	0.5	7/7	0.03	7/7	10^{-4}	0.5	7/7	0.03	7/7
10^{-2}	.5	7/7	.03	7/7	10^{-5}	.5	5/7	.03	5/7
10^{-3}	.5	7/7	.03	7/7	10^{-6}	.5	4/7	.03	2/7

[1] Numerator=number of mice dying; denominator=number of mice inoculated.

Studies were made to determine whether comparable results could be obtained by using, as a source of virus, tissues of guinea pigs dying as a result of this infection. A guinea pig which had succumbed was autopsied and the liver and lungs were made into 10-percent tissue emulsions in salt solutions. Further tenfold dilutions were then made in salt solution to a final dilution of 10^{-8}. Groups of five mice each were inoculated intracerebrally or intraperitoneally with 0.03 cc. or

0.3 cc. of each serial dilution of each tissue emulsion. The results, shown in table 4, indicate that there is little difference in the infectivity for mice of these tissue suspensions given by either of the routes of inoculation employed. It is likewise apparent that a considerable concentration of virus is present in both the liver and lungs of guinea pigs and that the concentration in this host is similar to that attained in mice.

TABLE 4.—*Results of inoculation of mice intraperitoneally or intracerebrally with serial tenfold dilutions of suspensions of liver or lung taken from a guinea pig dying from Louisiana pneumonitis virus infection*

Dilutions of tissue suspension	Liver suspension		Lung suspension		Dilutions of tissue suspension	Liver suspension		Lung suspension	
	Number of mice dying following intraperitoneal inoculation [1]	Number of mice dying following intracerebral inoculation [1]	Number of mice dying following intraperitoneal inoculation [1]	Number of mice dying following intracerebral inoculation [1]		Number of mice dying following intraperitoneal inoculation [1]	Number of mice dying following intracerebral inoculation [1]	Number of mice dying following intraperitoneal inoculation [1]	Number of mice dying following intracerebral inoculation [1]
10^{-1}	5/5	5/5	4/5	5/5	10^{-5}	5/5	5/5	3/5	2/5
10^{-2}	5/5	5/5	5/5	5/5	10^{-6}	4/5	3/5	1/5	1/5
10^{-3}	5/5	5/5	5/5	5/5	10^{-7}	3/5	2/5	0/5	0/5
10^{-4}	5/5	5/5	4/5	5/5	10^{-8}	0/5	1/5	0/5	0/5

[1] Numerator=number of mice dying; denominator=number of mice inoculated.

Reaction of mice to virus when administered by various routes.—As previously shown, mice are susceptible to virus obtained directly from humans by intraperitoneal, intracerebral, or intranasal introduction of virus, but it seemed important to determine whether or not mice were susceptible to infection when inoculated by other routes.

Strain M97 of Louisiana pneumonitis virus had been passed through 31 generations of mice before these experiments were begun and was used between the thirty-second and thirty-sixth mouse passage. Strain B had been passed through only 6 generations of mice and had been stored in a CO_2 box before inception of this study. Thus, in the study strains of virus of both recent and distant origin from a patient were employed. Inoculations were made with 10-percent mouse-spleen suspensions except for the last 2 passages with strain B when brain suspensions were used. Doses of 0.03 cc. were given intracerebrally and 0.3 cc. by the other routes (intramuscular, intraperitoneal, and subcutaneous). Groups of 8 mice were inoculated by each route. Strain M97 was given to a total of 24 mice intramuscularly and 32 mice by each of the other routes. Strain B was administered to a total of 16 mice intramuscularly and to 32 by other methods in the 4 consecutive tests given in the protocol (table 5). With the exception of 8 mice inoculated intraperitoneally and 3 which had been inoculated intracerebrally, which were killed in a moribund stage to provide material for further passage, all mice succumbed to infection. The data indicate that the mice receiving

TABLE 5.—*Results of inoculation of mice with 0.03 cc. of 10-percent mouse tissue virus (strain M97 in thirty-second to thirty-fifth mouse passage and strain B in seventh to tenth mouse passage) intracerebrally and with 0.3 cc of the same material intraperitoneally, intramuscularly, and subcutaneously* [1]

Strain of virus	Date of inoculation	Interval between inoculation and death in days			
		Intracerebral route	Intraperitoneal route	Intramuscular route	Subcutaneous route
	1943				
M97	Oct. 11	3-4	4	----------	7
	Oct. 15	3-4	3-4	5-7	4-7
	Oct. 18	3-4	3-4	4-8	4-8
	Oct. 21	2-4	2-4	4-7	4-7
B	Oct. 11	2-4	3-5	----------	5-8
	Oct. 14	2-5	4-5	----------	4-8
	Oct. 16	3-4	4-7	5-9	6-9
	Oct. 20	2-5	3-5	5-8	6-8

[1] None of the animals tested survived.

virus intracerebrally or intraperitoneally succumbed to infection in a shorter period than did those receiving virus subcutaneously or intramuscularly but that mice were susceptible to infection with this virus by any route of infection employed.

SUSCEPTIBILITY OF GUINEA PIGS TO INFECTION WITH THE VIRUS

Attempts were made to infect guinea pigs by the intraperitoneal route of injection only. These animals succumbed in from 6 to 8 days when large amounts of virus were administered, but death was delayed to 10 to 14 days if smaller amounts of virus were introduced. The mortality rate approximated 100 percent when large doses of virus were administered and progressively diminished to about 40 percent when 10^{-6} dilutions of infective mouse tissues were used as inocula. Animals given 0.25 cc. to 1.0 cc. of 10-percent suspensions of spleens from mice dying as a result of infection developed a fever 2 to 4 days following injection. A typical temperature reaction is given in figure 1. Temperatures have been recorded as high as 41.4° C. Marked weakness, loss of appetite, and progressive emaciation were noted about the fifth day after inoculation. The fur was ruffled and the animal was obviously ill. The day prior to death or on the day of death the temperature fell to normal or below, being as low as 37.8° C. in one instance. Enlargement of the spleen at autopsy was usual. A mucoid, viscous, stringy exudate covered the organs, and, in occasional animals, pulmonary consolidation involved one or all lobes of the lungs. This latter type of consolidation exhibited some of the characteristics described in the autopsies of human cases, and elementary bodies were demonstrated in smears made from such tissues.

CULTIVATION OF VIRUS IN EGGS

The initial cultivation of virus in the yolk sac was successfully accomplished by Senior Bacteriologist Ida A. Bengtson. The Cox

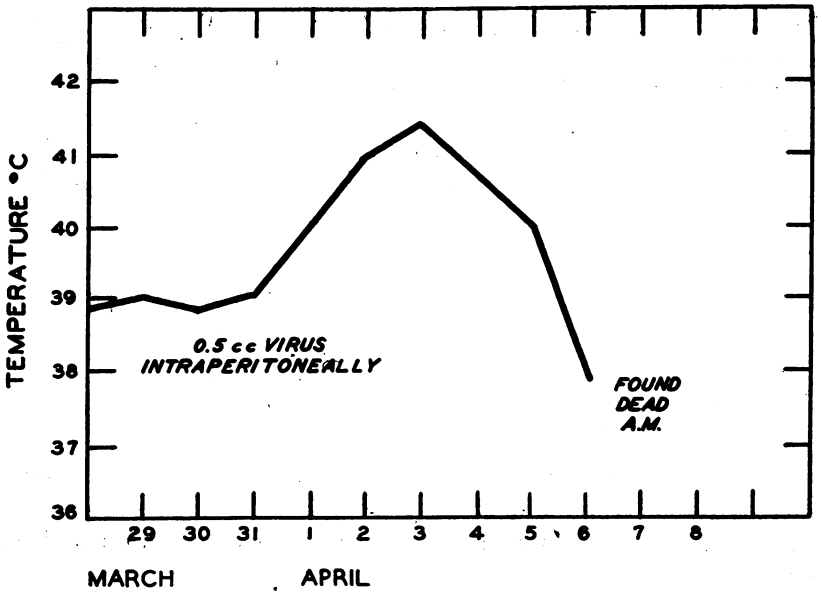

FIGURE 1.—Reaction of a guinea pig to intraperitoneal inoculation of 0.5 cc. of Louisiana pneumonitis virus.

technique was used and 0.5 cc. of 1:100 mouse-liver suspension (second passage in mice) was inoculated into the yolk sacs of 7- to 9-day-old embryos. Death of the embryo occurred in 3 to 5 days.

The virus was readily propagated thereafter through yolk-sac passage. A dose of 0.2 cc. of 1:10 or 1:100 yolk-sac virus suspension was used for inoculation of 7- to 9-day-old chick embryos. Death resulted in 3 to 5 days. The yolk sac presented no unusual changes but the embryos and chorioallantoic membranes were markedly hemorrhagic in appearance. The yolk sacs and embryos were harvested separately and frozen. Both types of material were ground in a Waring Blendor (care being taken to minimize heating) to obtain a uniform suspension. Titrations of suspensions in mice revealed a higher concentration of virus in the yolk sacs than in the embryo proper although substantial amounts of virus were present in the latter. Table 6 gives typical titrations of both types of material from the same lot of eggs when serial tenfold dilutions were given intracerebrally in doses of 0.03 cc. to mice.

Both egg-yolk membrane and chick-embryo virus were stored in a CO_2 ice box in 30-percent suspensions, and retained this potency over a period of 6 months.

FILTERABILITY OF THE VIRUS

A 1-percent suspension of spleen in salt solution was prepared from a mouse that died during the second mouse passage of virus isolated from the lung of one patient, case 17. The suspension was divided

TABLE 6.—*The infectivity of yolk-sac and embryo suspensions from eggs infected with Louisiana pneumonitis virus when administered intracerebrally in 0.03-cc. amounts*

Dilution of suspension	Embryo	Yolk sac	Dilution of suspension	Embryo	Yolk sac
	Number of mice dying [1]	Number of mice dying [1]		Number of mice dying [1]	Number of mice dying [1]
10^{-1}	8/8	8/8	10^{-5}	4/8	8/8
10^{-2}	8/8	8/8	10^{-6}	1/8	6/8
10^{-3}	8/8	8/8	10^{-7}	0/8	3/8
10^{-4}	8/8	8/8			

[1] Numerator=number of mice dying; denominator=number of mice inoculated.

into equal proportions, one of which was filtered through a Berkefeld N filter by means of negative pressure. Both the filtered and unfiltered emulsions were administered intraperitoneally to mice in doses of 0.5 cc., the former being inoculated into five mice and the latter into four mice. All animals succumbed. Those receiving unfiltered material died in 4, 4, 4, 6, and 6 days, while those receiving filtered lung suspensions died in 5, 6, 8, and 8 days, respectively.

A 1-percent suspension of liver tissue obtained from a mouse dying in the twenty-sixth mouse passage of virus isolated from case 17 was prepared. A portion was retained unfiltered for later inoculation. The remainder was divided into six approximately equal portions and filtered through new unused Mandler filters 2½ by ⅝ inches, grades 6, 7, 8, 9, 11, and 12. Filtration was effected with negative pressure. Following filtration of the infective material, each candle was immediately tested with a diluted 24-hour-old broth culture of *Serratia marcesens*. Doses of 0.03 cc. of unfiltered and filtered material were given to lots of eight mice each intracerebrally. The results are shown in table 7. The material failed to pass Mandler filters 11 and 12. Only two of eight animals receiving filtrate passing Mandler filter 9 died. Filter 8 was defective as evidenced by failure to hold back

TABLE 7.—*Showing the effect of filtering a 1 percent suspension of liver taken from mice dying during the twenty-sixth passage of virus through Mandler filters Nos. 6, 7, 8, 9, 11, and 12, and inoculating filtrates intracerebrally into groups of 8 mice each in 0.03-cc. doses*

Mandler filtrate No.	Retention of *B. prodigiosus*	Number of mice inoculated	Day of death									Ratio of deaths to mice inoculated [2]
			5th	6th	7th	8th	9th	10th	11th	12th	13th	
6	+	8			3		1	2		1	1	8/8
7	+	8			2		2	1		2	1	8/8
8 [1]	−	8	3	5								8/8
9	+	8			2							2/8
11	+	8										0/8
12	+	8										0/8
Unfiltered suspension		8	8									8/8

[1] Filter proved to be defective.
[2] Numerator=number of mice dying; denominator=number of mice inoculated.

B. prodigiosus. The virus passed through filter 6 and filter 7. It is apparent that the concentration of virus was diminished in the filtrate, for the time of death was prolonged among animals dying as a result of injection with filtered material as compared with animals dying as a result of injection of unfiltered material.

CENTRIFUGATION

The viruses belonging to the psittacosis-lymphogranuloma venereum group are not completely deposited by centrifugation at 3,500 to 4,000 r. p. m. for 1 hour. Studies were made to determine whether or not this condition held for the virus under consideration. In one instance a pooled liver emulsion of eight mice moribund on the fifth day after injection (thirty-second mouse passage of a strain isolated from the lung of case 17) was made into a 10-percent suspension in salt solution. This was centrifuged slowly for 5 minutes to remove the larger particulate matter. A sample of this material was saved for titration and a 10-cc. sample was centrifuged for 1 hour at 3,500 to 4,000 r. p. m. in an angle centrifuge. At the end of the period the supernatant was recovered (9.5 cc.) and an equal amount of salt solution added to the "button" of precipitate. The various samples were then diluted in serial tenfold dilutions in salt solution to an end point of 10^{-7} and inoculated intracerebrally under ether anesthesia in 0.03-cc. doses into lots of eight mice each. The animals were observed for 14 days. The results are given in table 8. In this test

TABLE 8.—*Results obtained after inoculating mice intracerebrally with 0.03 cc. of tenfold dilutions of 10-percent thirty-second mouse passage virus, resuspended precipitate, and supernatant after 1 hour centrifugation*

Material	Dilution [1]	Number of mice dying [2]
Uncentrifuged sample	10^{-4}	8/8
	10^{-5}	5/8
Resuspended precipitate	10^{-4}	8/8
	10^{-5}	6/8
Supernatant after centrifugation	10^{-4}	7/8
	10^{-5}	2/8

[1] All mice receiving 0.03 cc. of dilutions 10^{-1}, 10^{-2}, and 10^{-3} of each material died and all those receiving dilutions 10^{-7} and 10^{-8} survived.
[2] Numerator=number of mice dying; denominator=number of mice inoculated.

the amount of virus present in the resuspended precipitate resulting from centrifugation was not significantly greater than that contained in the uncentrifuged sample. A considerable amount of virus was also present in the supernatant fluid resulting from centrifugation.

RESISTANCE OF VIRUS TO DELETERIOUS AGENTS

It was deemed important to define within limits the resistance of this virus to certain deleterious agents and to determine the effects of heat upon the virus.

Chick-embryo tissue refrigerated in CO_2 ice was ground in a Waring Blendor without addition of fluid. The material was tested for infectivity for mice and found to kill all mice given a 10^{-4} suspension and three of eight mice inoculated intracerebrally with doses of 0.03 cc. of a 10^{-5} dilution of tissue. Portions of the suspension were added to equal volumes of 0.025-, 0.05-, and 0.1-percent formalin solution or 0.25-, 0.5-, or 1.0-percent phenol solutions, shaken, and placed in a refrigerator (4° C.). Portions were removed at the end of 1, 2, 5, and 24 hours after exposure and tested for infectivity for mice when inoculated intracerebrally in 0.03-cc. amounts.

Undiluted suspension was placed in glass ampules, the ampules sealed, and immersed in water baths maintained at 55° C. for 1 to 2 hours or 60° C. for 1 to 3 hours before being tested for infectivity for mice. The heat lability of the virus and the relatively greater virucidal activity of formaldehyde than of phenol is readily apparent from table 9.

TABLE 9.—*The effect of various concentrations of phenol and formaldehyde and of temperatures of 55° C. and 60° C. upon virus exposed for 1, 2, 5, and 24 hours to chemical action and 1 to 3 hours to heat and subsequently inoculated in 0.03-cc. quantities intracerebrally into lots of 8 mice each*

Agent	Concentration (percent)	Ratio of number of mice dying to number of mice inoculated after exposure to agents for various intervals [1]				
		1 hour	2 hours	3 hours	5 hours	24 hours
Formaldehyde	0.05	0/8		1/8	1/8	0/8
Formaldehyde	.025	2/8		4/8	2/8	0/8
Formaldehyde	.0125	6/8		4/8	1/8	0/8
Phenol	.5	[2]		[2]	[2]	[2]
Phenol	.25	[2]		3/8	0/8	1/8
Phenol	.125	7/8		4/8	2/8	4/8
Heat (60° C.)		3/8		0/8		
Heat (55° C.)		0/8	0/8			
None	None	7/8			7/8	7/8

[1] Numerator=number of mice dying; denominator=number of mice inoculated.
[2] Death of test mice within 24 hours after inoculation with test dose.

A 10-percent suspension of liver and spleen in salt solution was prepared from an infected mouse. This was used to test the effect of 37° C. temperatures on aqueous suspensions of virus. A sample of the suspension was removed for titration before the remainder was placed in an incubator having a constant temperature of 37° C. The material was shaken frequently, and at intervals of 1, 2, 4, and 24 hours portions were removed, diluted serially in salt solution in tenfold dilutions, and inoculated intraperitoneally into groups of five mice each in doses of 0.3 cc. The results (see table 10) show that there is a noticeable decrease in virus content of suspensions maintained in salt solution at 37° C. This decrease is detectable within 4 hours after exposure to this temperature and is magnified considerably in 24 hours.

TABLE 10.—*Deaths among mice inoculated intraperitoneally with 0.3-cc. amounts of serial tenfold dilutions of unheated virus and of virus subjected to 37° temperatures for 1, 2, 4, and 24 hours*

Dilution	Number of mice dying after inoculation with unheated virus [1]	Number of mice dying after inoculation of virus exposed to 37° temperature for 1—			
		1 hour	2 hours	4 hours	24 hours
10^{-1}	5/5	5/5	5/5	5/5	5/5
10^{-2}	5/5	5/5	5/5	5/5	5/5
10^{-3}	5/5	5/5	5/5	5/5	5/5
10^{-4}	5/5	5/5	5/5	5/5	1/5
10^{-5}	5/5	5/5	5/5	4/5	1/5
10^{-6}	5/5	5/5	5/5	2/5	0/5

[1] Numerator=number of mice dying; denominator=number of mice inoculated.

SUSCEPTIBILITY OF VARIOUS SPECIES OF ANIMALS TO INOCULATION WITH THE VIRUS

A number of species of animals other than mice and guinea pigs were tested to determine their susceptibility to intraperitoneal inoculation of infective material. These include monkeys, rabbits, white rats, cotton rats, hamsters, deer mice, ferrets, muskrats, and nutria.[2] Deaths and gross pathological lesions will be here recorded; observations regarding microscopic pathology will be reserved for a later report.

Two monkeys (*Macacus rhesus*) were injected intraperitoneally with 10-percent suspensions of tissue from case 17 which were proved infective for mice. One animal received 5 cc. of 10-percent spleen emulsion and the other 8 cc. of 10-percent lung emulsion intraperitoneally without ill effect. They were killed after being under observation for a period of 22 days. No gross lesions were noted at autopsy.

A large number of rabbits were injected intraperitoneally with yolk-sac emulsion and suspensions of mouse or guinea pig tissues. None of these animals showed the slightest reaction to administration of such material. Three rabbits were inoculated with fresh autopsy tissue from case 17, one receiving 5 cc. of 10-percent lung emulsion and two receiving 5 cc. of liver emulsion, with no resulting symptoms.

In one experiment, 9 white rats, 12 cotton rats (*Sigmodon hispidus*), and 12 hamsters (*Cricetus auratus*), 9 deer mice (*Peromyscus* sp), 2 ferrets (*Putorius foetidus*), 5 nutria (*Myocastor coypu*), and 10 muskrats (*Ondatra rivalicia*) were inoculated intraperitoneally with a 10-percent suspension of infected yolk sac. The ferrets and nutria were given 1.0 cc. of this suspension and the other animals received 0.5 cc. of the material. An additional 9 nutria and 11 muskrats were also given the virus intranasally. This virus had been previously titered and found to be capable of killing all mice receiving a 10^{-7} dilution of whole yolk sac. At the time the above animals were tested 40 guinea pigs were

[2] Acknowledgment is made to Chief Biologist James N. Gowanloch, and Special Biologist Ted O'Neil, State Department of Conservation of Louisiana, for obtaining and furnishing the muskrats used in this study, and to Mr. E. A. McIlhenny who supplied the nutria used in experimental work.

also inoculated; 20 receiving 1 cc. of 10-percent, and 20 receiving 1-percent yolk-sac virus by the same route.

Two white rats died on the fourth day and another on the fifteenth day following inoculation of virus. One animal was killed on the fourth day following injection and the remainder were killed on the twenty-first day, when the study was terminated.

Hamsters showed approximately the same degree of susceptibility as white rats. Only 4 of 12 animals died as a result of inoculation of virus: 2 succumbed on the fourth day, 1 on the sixth day, 1 on the thirteenth day following injection. Three animals were killed on the fourth day for histological examination, and 5 were alive on the twenty-eighth day when the study was terminated.

Twelve deer mice were injected with virus intraperitoneally. Four were sacrificed on the fourth day and a like number on the twenty-first day following injection of virus. One animal was found dead on the eighth day and another was moribund and was killed for further study. Elementary bodies were demonstrated in these animals.

Two ferrets, 5 nutria, and 10 muskrats receiving virus intraperitoneally showed no signs of infection and appeared normal when sacrificed 3 weeks after inoculation.

The 11 muskrats and 9 nutria inoculated intranasally likewise showed no signs of illness.

The susceptibility of guinea pigs was again well demonstrated in this study. Eight animals given 1.0 cc. of 10-percent yolk-sac suspension were killed to provide material for pathological examination on the fourth and sixth days, and 6 animals inoculated with 1.0 cc. of 1-percent yolk-sac emulsion were sacrificed on the same days for the same purpose. All of the remaining 26 guinea pigs died between the sixth and eleventh days following inoculation.

The disease produced in cotton rats was very severe. Twelve animals were inoculated with infective material and, with the exception of two killed when ill 4 days later, all died between the fourth and seventh days following infection. Cotton rats were the only animals exhibiting susceptibility to this virus comparable to that shown by white mice and guinea pigs.

The gross pathological lesions presented among animals in the above group which died as a result of exposure to infective material varied considerably. The lesions noted in guinea pigs have been previously described (page 1495). Among white rats the gross lesions closely resembled those noted among guinea pigs. The spleen was enlarged and dark, an excess of clear, sticky fluid was present in the peritoneal cavity, the liver was mottled and glistening, and the lungs showed areas of bronchopneumonia involving all lobes. Hamsters presented gross findings of fibrinous hepatitis and splenitis. The lesions observed in cotton rats were most marked. The abdominal viscera were

coated with a thick film of fibrinous plastic exudate to such a degree as to obscure the viscera from view on opening the abdominal cavity. No free fluid was present but the organs were adherent as a result of the exudate.

Birds were not used during this study since the facilities for isolating the virus were not considered adequate.

DISCUSSION

A virus fulfilling all the criteria to describe it as a member of the psittacosis-lymphogranuloma venereum group of organisms was isolated from three cases of a severe type of pneumonitis occurring in Louisiana. The agent was recovered during life from blood and sputum of patients and from lung and spleen tissue obtained at autopsy. Further, it was found capable of infecting both mice and guinea pigs on primary passage from materials taken directly from patients. Normal animals from a colony in a Louisiana laboratory and from a colony maintained at the National Institute of Health were equally susceptible to infection. In the course of previous studies and in the examinations of current stock animals no spontaneous infection remotely resembling the one in question has been encountered. The evidence thus proves that the agent isolated was that responsible for the infection in the three cases studied in this outbreak. The final proof of identity lies in the successful demonstration of elementary bodies in the passage strains isolated in experimental animals and in lung tissue of humans who succumbed to infection and from whom virus was isolated.

A number of points of difference exist between the agent and others belonging to this group. The fact that guinea pigs are susceptible to intraperitoneal inoculations of virus and present a disease syndrome including fever, emaciation, anorexia, and death serves to define the agent. The close analogy between the infective titer of virus administered to mice by intracerebral and intraperitoneal routes and the fact that mice succumb following inoculation by any route distinguishes the agent from others in the group. Results of complement fixation tests will be reported later.

SUMMARY

1. A virus has been isolated from three cases of severe pneumonitis in the bayou region of southwestern Louisiana.

2. It appears to be a new member of the psittacosis-lymphogranuloma venereum group of viruses and may be distinguished by its pathogenicity for guinea pigs and its infectivity for mice inoculated by subcutaneous or intramuscular routes.

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INCIDENCE OF HOSPITALIZATION, OCTOBER 1945

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among about 10,000,000 members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover about 60 hospital service plans scattered throughout the country, mostly in large cities:

Item	October	
	1944	1945
1. Number of plans supplying data	76	78
2. Number of persons eligible for hospital care	15,384,804	18,675,613
3. Number of persons admitted for hospital care	132,891	172,938
4. Incidence per 100 persons, annual rate, during current month (daily rate × 365)	102.0	109.0
5. Incidence per 1,000 persons, annual rate for the 12 months ended Oct. 31, 1945	104.3	106.2
6. Number of plans reporting on hospital days	22	26
7. Days of hospital care per case discharged during month [1]	7.66	8.38

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED NOVEMBER 17, 1945

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

	Week ended Nov. 17, 1945	Corresponding week, 1944
Data for 93 large cities of the United States:		
Total deaths	8,836	9,143
Average for 3 prior years	9,147	
Total deaths, first 46 weeks of year	411,700	412,943
Deaths under 1 year of age	595	616
Average for 3 prior years	620	
Deaths under 1 year of age, first 46 weeks of year	27,891	28,338
Data from industrial insurance companies:		
Policies in force	67,288,845	66,898,575
Number of death claims	10,767	14,054
Death claims per 1,000 policies in force, annual rate	8.3	11.0
Death claims per 1,000 policies, first 46 weeks of year, annual rate	10.0	10.0

PREVALENCE OF DISEASE

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

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 24, 1945

Summary

The incidence of poliomyelitis continued to decline. A total of 174 cases was reported, as compared with 255 last week, 221 for the corresponding week last year, and a 5-year median of 158. Only 6 States reported more than 7 cases each, as follows: California 28, New York and Illinois 18 each, Wisconsin 12, Missouri 10, and Ohio 9. The total to date is 13,101, as compared with 18,712 and 11,993, respectively, in the epidemic years of 1944 and 1943, and a 5-year median of 9,379.

A total of 81 cases of meningococcus meningitis was reported (a smaller number than for any of the past 5 weeks), as compared with 141 for the corresponding week last year and a 5-year median of 93. Only 3 States reported more than 5 cases each—New York 14, Missouri 7, and California 6. The cumulative figure is 7,395, as compared with 15,126 and 16,256 for the corresponding periods of 1944 and 1943, respectively, and a 5-year median of 3,196.

For the current week, 5,240 cases of influenza were reported, as compared with 4,146 last week and a 5-year median of 1,854. Of the total (a larger number than for the corresponding week of recent years), an aggregate of 4,304, or 85 percent, occurred in 6 States, as follows (last week's figures in parentheses): Indiana 284 (109); Virginia 607 (400); South Carolina 829 (842); Texas 2,056 (1,635); Colorado 303 (113); Utah 225 (19). For the corresponding week last year these States reported an aggregate of 1,404, or about 80 percent of the total for that week. The total to date is 97,818, as compared with 354,112 for the period last year and a 5-year median of 179,196.

A total of 653 cases of diphtheria was reported as compared with 756 last week, a 5-year median of 399, and 435 for the corresponding week last year. The States reporting numbers considerably in excess of figures for the corresponding week last year are as follows (last year's figures in parentheses): Ohio 58 (11); Michigan 41 (17); Maryland 19 (4); Virginia 26 (12); North Carolina 73 (20); Tennessee 37 (15); Alabama 30 (23); and Arkansas 37 (9).

During the current week, 8,503 deaths were recorded in 92 large cities in the United States, as compared with 8,810 last week, 8,446 for the corresponding week last year, and a 3-year average of 8,580. The total to date is 418,477, as compared with 419,687 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended November 24, 1945, and comparison with corresponding week of 1944 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44
	Nov. 24, 1945	Nov. 25, 1944		Nov. 24, 1945	Nov. 25, 1944		Nov. 24, 1945	Nov. 25, 1944		Nov. 24, 1945	Nov. 25, 1944	
NEW ENGLAND												
Maine	3	2	1	4	------	------	1	2	64	0	0	0
New Hampshire	4	0	0	------	------	------	------	------	5	0	1	1
Vermont	0	0	0	------	------	------	------	3	12	0	0	0
Massachusetts	3	7	5	------	------	------	110	77	158	2	9	4
Rhode Island	0	0	0	------	23	------	1	------	2	0	2	1
Connecticut	0	1	0	------	1	1	5	15	15	1	0	1
MIDDLE ATLANTIC												
New York	13	14	14	[1] 5	[1] 1	3	99	69	257	14	28	9
New Jersey	1	4	2	3	2	4	16	9	27	2	4	4
Pennsylvania	7	10	11	2	------	------	364	32	332	5	11	6
EAST NORTH CENTRAL												
Ohio	58	11	11	7	5	12	21	17	34	4	16	2
Indiana	16	14	13	284	4	4	3	9	17	5	4	1
Illinois	3	4	17	4	1	6	204	17	35	5	8	5
Michigan [2]	41	17	12	2	------	1	177	18	62	3	7	4
Wisconsin	1	0	1	94	10	19	16	15	157	0	3	1
WEST NORTH CENTRAL												
Minnesota	8	14	1	------	------	------	4	5	10	2	4	0
Iowa	8	5	5	------	1	1	1	8	23	0	0	0
Missouri	9	10	9	4	1	3	32	2	5	7	0	1
North Dakota	1	8	6	48	------	------	3	2	2	0	0	0
South Dakota	2	0	1	------	------	------	------	2	2	0	0	0
Nebraska	0	2	5	25	------	------	1	11	11	1	0	0
Kansas	7	2	6	1	1	1	18	3	15	0	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	------	2	2	0	2	0
Maryland [2]	19	4	6	5	6	5	5	------	16	0	1	1
District of Columbia	0	0	1	------	1	1	1	3	3	0	2	0
Virginia	26	12	24	607	139	157	63	3	48	0	1	2
West Virginia	7	2	8	150	1	13	------	5	14	1	2	1
North Carolina	73	20	27	------	2	5	12	4	8	3	1	1
South Carolina	15	4	10	829	415	331	10	8	8	1	2	1
Georgia	22	19	19	26	28	28	1	3	5	0	4	0
Florida	3	13	8	6	2	2	4	2	8	0	1	0
EAST SOUTH CENTRAL												
Kentucky	12	10	10	1	2	3	38	1	32	1	2	2
Tennessee	37	15	15	96	13	15	3	13	13	4	8	1
Alabama	30	23	21	150	18	52	1	1	9	1	2	1
Mississippi [2]	13	12	11	------	------	------	------	------	------	2	0	1
WEST SOUTH CENTRAL												
Arkansas	37	9	15	81	44	62	19	8	8	1	0	0
Louisiana	18	21	8	1	4	4	3	1	1	1	0	0
Oklahoma	11	17	11	41	64	64	4	6	3	1	0	0
Texas	73	66	43	2,056	837	807	39	26	26	5	5	4
MOUNTAIN												
Montana	1	8	3	39	1	5	4	1	13	1	0	0
Idaho	3	0	0	14	1	------	127	4	6	0	0	0
Wyoming	0	0	0	45	18	2	4	7	7	0	0	0
Colorado	6	4	6	303	9	12	7	7	26	0	1	1
New Mexico	9	5	2	3	2	2	3	------	3	0	1	0
Arizona	2	0	3	49	70	105	2	4	6	1	0	0
Utah [2]	0	0	0	225	------	3	21	7	7	0	0	0
Nevada	0	0	0	------	------	------	------	------	0	0	0	0
PACIFIC												
Washington	6	5	3	------	4	1	218	13	13	1	1	1
Oregon	9	7	2	7	9	11	8	18	25	0	0	0
California	36	34	25	23	21	36	263	138	70	6	7	7
Total	653	435	399	5,240	1,761	1,854	1,936	601	2,648	81	141	93
47 weeks	16,160	12,164	13,851	97,818	354,112	179,196	115,847	598,363	566,993	7,395	15,126	3,196

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended November 24, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [2]		
	Week ended—		Median	Week ended—		Median	Week ended—		Median	Week ended—		Median
	Nov. 24, 1945	Nov. 25, 1944	1940–44	Nov. 24, 1945	Nov. 25, 1944	1940–44	Nov. 24, 1945	Nov. 25, 1944	1940–44	Nov. 24, 1945	Nov. 25, 1944	1940–44
NEW ENGLAND												
Maine	0	3	0	24	31	17	0	0	0	1	0	0
New Hampshire	0	0	0	2	13	13	0	0	0	0	1	0
Vermont	1	1	0	15	6	7	0	0	0	0	0	0
Massachusetts	7	4	4	104	223	170	0	0	0	2	0	1
Rhode Island	0	0	0	5	5	5	0	0	0	0	1	0
Connecticut	5	3	2	21	24	25	0	0	0	0	0	2
MIDDLE ATLANTIC												
New York	18	71	11	210	223	216	0	0	0	3	2	6
New Jersey	4	3	1	26	29	63	0	0	0	0	1	1
Pennsylvania	3	14	4	176	191	187	0	0	0	1	1	7
EAST NORTH CENTRAL												
Ohio	9	10	8	230	252	237	0	0	0	2	1	3
Indiana	1	6	4	59	83	72	3	1	1	2	0	1
Illinois	18	2	5	147	174	168	0	0	2	1	4	3
Michigan [3]	6	7	7	139	173	115	1	0	1	3	1	1
Wisconsin	12	0	3	63	81	111	0	0	0	1	1	1
WEST NORTH CENTRAL												
Minnesota	3	4	4	38	59	59	0	0	0	0	0	0
Iowa	2	1	1	44	52	56	0	0	0	0	0	0
Missouri	10	2	3	42	43	58	0	0	0	4	0	0
North Dakota	0	0	0	4	12	11	0	0	0	1	0	0
South Dakota	0	0	0	7	5	24	0	0	0	1	0	0
Nebraska	3	2	2	52	50	16	0	0	0	0	0	0
Kansas	1	1	2	59	82	82	0	0	0	3	1	1
SOUTH ATLANTIC												
Delaware	2	0	0	4	1	6	0	0	0	0	0	0
Maryland [3]	1	6	1	38	66	43	0	0	0	0	1	1
District of Columbia	1	0	0	12	21	21	0	0	0	0	0	0
Virginia	1	14	2	131	50	57	0	0	0	3	3	6
West Virginia	2	3	0	87	71	65	0	0	0	1	2	1
North Carolina	1	5	3	91	98	95	0	0	0	1	0	1
South Carolina	2	2	0	8	2	10	0	0	0	0	0	1
Georgia	1	0	0	42	44	40	0	0	0	2	0	1
Florida	1	3	1	2	11	9	0	0	0	2	1	2
EAST SOUTH CENTRAL												
Kentucky	0	9	3	50	34	69	0	0	0	3	0	4
Tennessee	7	3	3	79	84	92	0	0	0	0	3	3
Alabama	1	0	0	19	18	30	0	0	0	5	1	1
Mississippi [3]	2	0	0	22	23	18	3	0	0	1	0	2
WEST SOUTH CENTRAL												
Arkansas	0	2	0	20	37	15	0	3	0	0	2	2
Louisiana	4	0	0	14	15	7	0	0	0	0	6	5
Oklahoma	1	1	1	21	31	23	0	0	0	1	0	2
Texas	4	7	7	111	93	75	0	0	0	15	8	6
MOUNTAIN												
Montana	0	1	1	7	22	24	1	0	1	3	4	0
Idaho	0	0	0	6	25	11	0	1	0	0	0	0
Wyoming	0	0	0	3	7	5	0	0	0	0	0	0
Colorado	1	1	1	24	71	31	0	0	0	1	1	1
New Mexico	0	1	0	7	15	6	0	0	0	1	1	1
Arizona	1	1	0	12	11	5	0	0	0	0	0	1
Utah [3]	1	1	1	17	18	13	0	0	0	0	0	1
Nevada	0	0	0	2	4	0	0	0	0	0	0	0
PACIFIC												
Washington	7	5	1	34	54	29	0	0	0	1	5	1
Oregon	2	10	3	20	51	25	0	0	0	0	0	0
California	28	12	12	224	239	160	0	0	0	1	2	2
Total	174	221	158	2,574	3,027	2,642	8	5	12	66	54	71
46 weeks	13,101	18,712	9,379	159,101	172,105	124,926	320	358	719	4,597	5,100	6,374

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Maine 1; Massachusetts 2; New York 1; Michigan 2; Texas 1.

Telegraphic morbidity reports from State health officers for the week ended November 24, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Whooping cough			Week ended November 24, 1945							
	Week ended—		Median 1940–44	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Nov. 24, 1945	Nov. 25, 1944		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	15	23	23	0	0	0	0	0	0	0	0
New Hampshire	----	----	2	0	0	0	0	0	0	0	0
Vermont	28	39	31	0	0	0	0	0	0	0	0
Massachusetts	150	133	134	0	1	0	0	0	0	0	2
Rhode Island	35	1	22	0	1	0	0	0	0	0	0
Connecticut	42	70	73	0	1	0	0	0	0	0	2
MIDDLE ATLANTIC											
New York	303	202	439	3	16	0	2	0	0	3	7
New Jersey	140	64	147	3	0	1	0	0	0	0	0
Pennsylvania	206	101	223	0	2	0	0	0	1	0	1
EAST NORTH CENTRAL											
Ohio	154	114	211	0	0	0	0	0	0	0	0
Indiana	17	6	25	1	1	0	2	0	2	0	0
Illinois	143	42	132	4	11	0	0	0	3	0	6
Michigan [3]	142	69	279	1	2	0	0	0	1	0	2
Wisconsin	90	79	172	0	0	0	0	0	0	0	8
WEST NORTH CENTRAL											
Minnesota	19	48	48	2	1	0	0	0	0	0	0
Iowa	7	4	20	0	0	0	0	0	0	0	0
Missouri	3	19	19	0	0	0	0	0	0	0	0
North Dakota	----	12	9	0	0	0	0	0	0	0	2
South Dakota	----	4	4	0	0	0	0	0	0	0	2
Nebraska	8	5	8	0	0	0	0	0	0	0	0
Kansas	25	32	48	0	0	0	0	0	0	0	2
SOUTH ATLANTIC											
Delaware	----	3	11	0	0	0	0	0	0	0	0
Maryland [3]	33	70	70	0	0	0	0	0	0	0	0
District of Columbia	5	4	9	0	0	0	0	0	0	0	0
Virginia	37	42	51	0	0	32	0	2	2	0	0
West Virginia	30	4	17	0	0	0	0	0	0	0	0
North Carolina	64	44	102	2	1	0	0	0	0	4	0
South Carolina	55	26	31	2	19	0	0	0	0	11	0
Georgia	5	4	15	2	1	1	0	0	0	40	3
Florida	----	24	9	0	0	0	0	0	0	2	1
EAST SOUTH CENTRAL											
Kentucky	42	16	67	0	0	0	0	0	2	0	0
Tennessee	15	33	33	0	0	1	0	0	0	1	0
Alabama	40	21	17	2	0	0	0	0	1	9	0
Mississippi [3]	----	----	----	0	0	0	0	0	0	1	0
WEST SOUTH CENTRAL											
Arkansas	6	10	10	0	0	0	0	0	0	1	0
Louisiana	1	----	4	0	0	0	0	0	0	6	1
Oklahoma	12	8	8	2	5	1	0	0	0	0	0
Texas	78	125	102	10	207	39	0	0	1	26	11
MOUNTAIN											
Montana	2	15	16	0	0	0	1	0	0	0	0
Idaho	11	3	3	0	0	0	1	0	0	0	1
Wyoming	----	----	1	1	0	0	0	0	0	0	0
Colorado	23	31	31	0	0	0	0	0	0	0	0
New Mexico	16	----	4	0	1	2	0	0	0	0	0
Arizona	1	3	4	0	0	16	0	0	0	0	0
Utah [3]	6	2	14	0	0	0	0	0	0	0	0
Nevada	2	----	0	0	0	0	0	0	0	0	0
PACIFIC											
Washington	53	18	32	0	0	0	0	0	0	0	1
Oregon	8	2	10	0	0	1	0	0	0	0	0
California	112	92	152	2	6	0	2	0	1	2	3
Total	2,184	1,667	3,243	37	276	94	8	2	14	106	55
Same week, 1944	1,667	----	----	17	656	134	9	2	6	136	54
Average, 1942–44	2,682	----	----	31	449	64	10	[4]1	12	[4]63	----
47 weeks: 1945	113,537	----	----	1,777	22,868	9,976	587	463	664	4,761	4,513
1944	86,588	----	----	1,685	22,341	8,315	598	453	506	4,805	3,603
Average, 1942–44	138,555	----	[4]162,372	1,583	16,558	7,167	588	[4]451	673	[4]3,355	----

[3] Period ended earlier than Saturday.
[4] 5-year median, 1940–44.

Leprosy: Louisiana 1 case.

NOTIFIABLE DISEASES, THIRD QUARTER 1945 [1]

The figures in the following table are the totals of the monthly morbidity reports received from the State health authorities for July, August, and September 1945. These reports are preliminary and the figures are therefore more or less incomplete. In most instances they include cases reported in both civilian and military populations. The comparisons made are with similar preliminary reports; but owing to population shifts and the presence of large military populations in certain States, the figures for some States are not comparable with those for prior years, especially for certain diseases. Each State health officer has been requested to include in the monthly report for his State all diseases that are required by law or regulation to be reported in the State, although some do not do so. The lists of diseases required to be reported are not the same for each State. Only 11 of the common communicable diseases are notifiable in all the States. In some instances cases are reported, in some States, of diseases that are not required by law or regulation to be reported, and the figures are included although manifestly incomplete. There are also variations among the States in the degree of completeness of reporting of cases of the reportable diseases. As compared with the deaths, incomplete case reports are obvious for such diseases as malaria, pellagra, pneumonia, and tuberculosis, while in many States other diseases, such as puerperal septicemia and Vincent's infection, are not reportable.

In spite of these known deficiencies, however, these monthly reports, which are published quarterly and annually in consolidated form, have proved of value in presenting early information regarding the reported incidence of a large group of diseases and in indicating a trend by providing a comparison with similar preliminary figures for prior years. To some extent they also give a picture of the geographic prevalence of certain diseases, as the States are arranged by geographic location.

Leaders are used in the table to indicate that no case of the disease was reported.

Consolidated monthly State morbidity reports for July, August, and September 1945

Division and State	Anthrax	Chickenpox	Conjunctivitis [2]	*Diphtheria	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, infectious	German measles	Hookworm disease	Influenza	Malaria [3]	*Measles	*Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENGLAND																		
Maine	----	217	----	8	----	----	----	1	14	----	16	9	21	4	207	----	1	110
New Hampshire	3	28	----	----	----	----	----	----	8	----	1	4	13	5	72	----	----	10
Vermont	----	116	----	8	----	----	----	1	52	----	----	2	89	2	341	----	----	2
Massachusetts	1	574	53	38	7	108	----	1	149	2	----	307	1,156	23	1,192	38	----	‡ 262
Rhode Island	----	35	----	2	----	11	----	4	1	----	293	7	9	9	44	----	----	70
Connecticut	1	210	----	3	1	185	----	3	45	5	3	75	150	19	508	----	----	202
MIDDLE ATLANTIC																		
New York	1	1,478	----	93	45	191	----	21	----	----	‡ 17	311	451	128	‡ 780	8	----	2,283
New Jersey	1	625	----	29	8	5	19	4	128	----	15	342	249	34	826	6	----	462
Pennsylvania	8	538	----	68	3	2	----	3	----	----	11	----	1,168	78	740	3	1	420
EAST NORTH CENTRAL																		
Ohio	----	691	----	84	2	3	11	4	70	----	26	39	162	56	396	126	----	397
Indiana	----	113	2	65	14	2	17	11	21	1	47	86	80	33	141	----	----	49
Illinois	----	445	----	32	55	57	----	13	70	1	31	8	1,381	68	519	93	----	900
Michigan	----	992	6	137	23	32	1	----	163	----	7	178	774	46	604	7	----	404
Wisconsin	----	1,518	----	30	4	----	----	1	55	----	76	31	510	34	1,614	----	----	81

WEST NORTH CENTRAL																		
Minnesota		190		113	[6] 20	2	9	3			10	73	48	28				43
Iowa		83		17	5			4	11			135	112	10	201			10
Missouri		73	2	32			12	1	25		16	157	125	46	279			210
North Dakota		29		33	1			2			28		10					69
South Dakota		51	2	36								1	47	8	22			9
Nebraska		33		27				1			16		42	4	71			48
Kansas		50	1	94	2	7		12	12		5	197	118	13	344			142
SOUTH ATLANTIC																		
Delaware		1		1								13	9	1	21			3
Maryland		91	7	100	2	20	25		19		4	96	42	15	119	4		220
District of Columbia		26		1		4					1	20	5	11	45			95
Virginia		122		99	3		4,645				1,109	208	70	33	150		3	269
West Virginia		82		78	13	1					96	48	10	22	16			8
North Carolina				379	5	38						292	56	30				
South Carolina		84		204	34	624			40	340	1,252	3,741	100	6	493	9	237	475
Georgia	1	30	22	189	8	77	15			918	55	380	25	14	74		5	77
Florida		23	4	51	23	7	1	1	3	717	18	105	37	19	283	5		124
EAST SOUTH CENTRAL																		
Kentucky		65		123	4	14		1			1	204	120	24	66		3	71
Tennessee		30		182	6		71	5	9		83	53	61	45	85	3	13	209
Alabama		18		191	32			2	74		220	1,278	20	35	133		8	417
Mississippi		573		191	349	3,850				1,473	4,295	7,969	566	17	1,038	7	605	1,611
WEST SOUTH CENTRAL																		
Arkansas		37		85	54	208			22	1	119	1,175	80	23	174		5	328
Louisiana	1	9		108	31	81			16	21	305	331	70	28	54	10	3	589
Oklahoma		17		36	6	71	6	4			166	467	63	11	63	1	5	196
Texas		600		566	192	6,426	376	5			5,222	3,179	776	77	1,104	13	215	1,424
MOUNTAIN																		
Montana		172	7	13		7	1		18		41	14	135	5	169			41
Idaho		121	3	15		12	9		45		48	29	271	2	56			34
Wyoming		13		3			4				2	2	26	1	19			26
Colorado		123		44	1			2	7		115	[7] 174	87	10	160			173
New Mexico		20		41	2	60	22		2		15	11	38		34		3	139
Arizona		59	12	32			285	4	14		201	45	38	2	84	4	3	160
Utah		308		7					33		29	17	697	2	330			14
Nevada		[8] 10	3	1							5	2	21	1	10			6
PACIFIC																		
Washington		389	3	59	1	4	179	14	202		10	4	813	23	701			245
Oregon		154		43	1	1	24				14	4	220	12	153			83
California	1	2,363	5	279	41	65		212	833		98	427	3,007	166	3,874			492
Total	18	13,629	132	4,070	998	12,175	5,732	340	2,161	3,479	14,142	22,250	14,178	1,283	18,109	337	1,110	13,827
Third quarter, 1944	12	13,604	210	3,251	1,044	14,029	4,369	235	1,876	4,029	11,782	23,894	19,452	2,085	14,675	417	1,303	13,044
Median, 1940–44	18	13,304		3,101	1,024	11,715	4,369	275	3,409	4,029	11,418	27,192	24,405	660	15,677	274	1,564	13,414
Alaska		20		3			8				103		5	2	7			13
Hawaii Territory		118		6	19	62		1	47	89	6,270	[9] 42	708	6	70			[6] 25
Panama Canal Zone [9]		18		19	12	11						180	12	1	22			[10] 111

See footnotes at end of table.

Consolidated monthly State morbidity reports for July, August, and September 1945—Continued

Division and State	*Poliomyelitis	Rabies in man	Rheumatic fever	Rocky Mountain spotted fever	*Scarlet fever	Septic sore throat	*Smallpox	Tetanus	Trachoma	Trichinosis	*Tuberculosis, all forms	Tuberculosis, respiratory	Tularemia	*Typhoid and paratyphoid fever	Paratyphoid fever	Typhus fever, endemic	*Undulant fever	Vincent's infection	Whooping cough
NEW ENGLAND																			
Maine	46				147	4		1		1	127	121		9			11	4	527
New Hampshire	26				90	14		1			31			4			4	3	68
Vermont	36				31	40					5			1			18	17	243
Massachusetts	326				611	49		7	1	3	750	713		70	66		10		1,695
Rhode Island	5		28		33	6					155	146		4	2		3		158
Connecticut	138			1	96	117				1	238	232		12			27		437
MIDDLE ATLANTIC																			
New York	1,215			7	[11] 1,357			9		1	3,310	3,095	1	82	12	6	71		4,223
New Jersey	765			6	240	12		3		5	931			53	9	2	18		2,310
Pennsylvania	541		444	4	750			3		1	970		1	114		1	25		2,487
EAST NORTH CENTRAL																			
Ohio	276	1	12	2	844	11	1	4	2	2	1,325	1,284		69	6		15	6	2,200
Indiana	125	1		8	219	10	1	4	1		605	576		29	1		18	46	349
Illinois	761		34	10	669	34	4	16	12		1,689	1,489	11	32	2		98	23	1,362
Michigan	125		70		812	53	6	6			1,298			54	32		74		1,591
Wisconsin	205				479	14	1		3		559		4	5			76		845
WEST NORTH CENTRAL																			
Minnesota	130		15		258	90	2	3			[6] 358		6	5	1		73	16	186
Iowa	166				168	4	1				194			20	1		49	35	103
Missouri	140		14	4	208	7	1				594		10	32			16		382
North Dakota	9		1		66	6	1				45	43		4			5	21	30
South Dakota	13				34		2		3		63			3	1		8	2	30
Nebraska	77				140		2				194			5			3		16
Kansas	83		2	3	323	10	1	4	1	6	198	185	5	15		1	56	48	367

SOUTH ATLANTIC																		
Delaware	23			2	21					38	27		6			1		30
Maryland	79		21	12	238	28		3		783	752		20	3	[12] 1	1	20	684
District of Columbia	97			1	74					353	320		5	1		1		142
Virginia	258			70	361	462	1	7		911	911	15	83	5	7	15		968
West Virginia	41			5	374	1				642			43	1		1		334
North Carolina	83			43	371	49				835	812	3	40	1	43	6		1,564
South Carolina	116		136	3	103	6		1		197		3	65	11	96	11		908
Georgia	56	1	4	14	128	42		5		458	458	7	105	28	441	47	26	218
Florida	57				38	13		1		292	288	2	58	4	124	4	13	81
EAST SOUTH CENTRAL																		
Kentucky	31			11	242	7	2			563	558	4	96	1		4		585
Tennessee	297			9	282	29		10		874		16	186	2	16	17	26	386
Alabama	67	1		6	154		1	13		816		1	50	4	281	30		226
Mississippi	29				97		1		13	423	412	11	47		108	49		1,494
WEST SOUTH CENTRAL																		
Arkansas	32	1		3	85	111	5	2	145	313	298	45	54	3	7	18		163
Louisiana	59	1	85	1	100	197		20		724	682	8	78	8	193	16		136
Oklahoma	152			21	87	49		3	46	593		9	56	3		15	4	203
Texas	570				507	388	1		49	1,573		7	246	37	752	155		2,133
MOUNTAIN																		
Montana	47		20		52	22			2	105	50	5	21	8		2	8	61
Idaho	12		16	5	44	38	1	1		79		1	17			8	45	91
Wyoming	14			3	28	13				18		9	3	2		4		41
Colorado	104		31	4	127	56				139			23	3		11	29	575
New Mexico	10				65	3			3	[6] 806	[6] 790	1	36	3		3		83
Arizona	7		1		27	6			70	381			12	1		8	2	135
Utah	185		44	4	66	1			1	23	21	7	8	3		27		313
Nevada	11		1		4	21			2	45		3					19	13
PACIFIC																		
Washington	171		55	1	188	15		1		589		2	17	4		14	71	342
Oregon	34			3	103	13	2	1	1	136	130		14			16		192
California	425		177		1,447		1	25	5	3,044	2,870	4	79	12	7	65		2,700
Total	8,275	6	1,211	266	12,988	2,051	38	154	360	23	29,392	17,263	201	2,090	281	2,086	1,227	484	34,371
Third quarter, 1944	13,530	17	540	257	11,912	1,574	58	145	599	66	32,577	18,776	165	2,262	353	2,416	1,301	544	30,308
Median, 1940–44	5,794	9		208	11,559	1,209	85	145	757	66	27,201	16,281	229	2,951		1,557	1,000	486	46,158
Alaska					4						116	76	1	1				2	6
Hawaii Territory	4				72	10		8	2		177	153		3	1	27	1		
Panama Canal Zone [9]											[10] 13	[10] 13		6	6				[10] 7

See footnotes on p. 1512.

See references on pps. 1508-9-10-11

*Diseases marked with an asterisk (*) are reportable by law or regulation in all the States, including the District of Columbia. Typhoid fever is reportable in all the States; paratyphoid fever in all except 6 States. Syphilis is reportable in all the States and the District of Columbia but is not included in the table. Conjunctivitis was dropped from the list of reportable diseases in North Carolina on Jan. 1, 1945.

[1] For reports for first and second quarters of 1945, see pp. 622 and 1150 of the PUBLIC HEALTH REPORTS of June 1 and Sept. 28, 1945, respectively.
[2] Includes cases of kerato- and suppurative conjunctivitis and of pink eye.
[3] In some States practically all in the military.
[4] Lobar pneumonia only.
[5] New York City only.
[6] Includes nonresidents.
[7] Exclusive of prisoners of war.
[8] Off-shipping.
[9] Includes the cities of Colon and Panama.
[10] In the Canal Zone only.
[11] Includes septic sore throat.
[12] Tsutsugamushi fever.

The following list includes certain rare conditions, diseases of restricted geographical distribution, and those reportable in or reported by only a few States:

Actinomycosis: New Hampshire 1, Massachusetts 1, Connecticut 1, Michigan 1, Minnesota 3, Washington 1.
Botulism: New York 1, California 5.
Coccidioidomycosis: New Mexico 1, Arizona 4, California 5.
Dengue: South Carolina 8, Georgia 2, Mississippi 10, Louisiana 38, Texas 7, Hawaii Territory 1.
Dermatitis: New Hampshire 2, Missouri 234, Kansas 1.
Diarrhea: New Jersey 1, Ohio 835 (including enteritis), Indiana 3, Michigan 2, Minnesota 68 (including enteritis), Maryland 74, South Carolina 4,429, Florida 9, Colorado 1, New Mexico 66, Utah 5, Oregon 4 (including enteritis), California 19.
Dog bite: New Hampshire 1, Illinois 3,278, Michigan 2,713, Arkansas 121.
Filariasis: New Jersey 1, Indiana 1.
Food poisoning: Maine 2, Ohio 1, Indiana 1, South Carolina 38, Louisiana 5, Idaho 2, Nevada 5, Washington 71, California 89.
Granuloma (unspecified): Ohio 19.
Granuloma inguinale: Missouri 6, Florida 69, Tennessee 18, Mississippi 177, Louisiana 75, Montana 1, Arizona 2.
Impetigo contagiosa: Ohio 2, Indiana 10, Illinois 11, Michigan 200, Iowa 6, Missouri 8, North Dakota 3, Kansas 15, Maryland 27, Montana 24, Idaho 2, Nevada 32, Washington 117, Hawaii Territory 18.
Jaundice (including hepatitis and Weil's disease): Maine 4, New York 1, Indiana 32, Illinois 102, Michigan 2, Minnesota 2, Maryland 1, South Carolina 9, Florida 6, Idaho 13, Utah 3, Washington 5, Oregon 2, California 66, Hawaii Territory 56.
Leprosy: New Jersey 1, Illinois 1, Michigan 3, Minnesota 1, Louisiana 3, California 5, Hawaii Territory 3.
Lymphocytic choriomeningitis: Massachusetts 2, Minnesota 1, Maryland 6, Tennessee 10.
Lymphogranuloma venereum: Missouri 12, Florida 63, Tennessee 27, Louisiana 45, Utah 3.
Psittacosis: New York 1, Delaware 1, California 2.
Puerperal septicemia: Florida 1, Mississippi 29, Arkansas 3, Louisiana 10.
Rabies in animals: New York 116, Ohio 173, Illinois 104, Michigan 8, Iowa 15, Missouri 6, Kansas 4, Maryland 8, District of Columbia 11, South Carolina 19, Florida 2, Alabama 188, Arkansas 33, Louisiana 14, Texas 190, New Mexico 2, Utah 1, California 95.
Rat bite fever: Kansas 1, South Carolina 1, Louisiana 4.
Relapsing fever: Kansas 1, Texas 9, Nevada 14, California 3.
Ringworm: Pennsylvania 214, Ohio 4, Indiana 9, Illinois 240, Michigan 200, Minnesota 182, Missouri 4, Kansas 1, Nevada 1, Washington 45.
Scabies: Pennsylvania 14, Michigan 103, Missouri 2, South Dakota 1, Kansas 11, Maryland 28, Montana 33, Idaho 10, Nevada 20.
Silicosis: Ohio 3, Missouri 1, Kansas 1, Idaho 1, New Mexico 2, Utah 4, Washington 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended November 17, 1945

This table lists the reports from 84 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infections, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	1	0	------	0	0	0	0	0	1	0	0	4
New Hampshire:												
Concord	0	0	------	0	1	0	0	0	2	0	0	0
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	1	0	------	0	5	2	18	14	19	0	1	29
Fall River	0	0	------	0	0	0	0	0	4	0	0	0
Springfield	0	0	------	0	1	0	1	0	3	0	0	0
Worcester	0	0	------	0	9	0	9	2	3	0	0	13
Rhode Island:												
Providence	0	0	------	0	0	0	3	0	1	0	0	18
Connecticut:												
Bridgeport	0	0	------	0	0	0	0	1	2	0	0	0
Hartford	0	0	------	0	0	1	2	0	0	0	0	5
New Haven	0	0	------	0	1	0	1	0	2	0	0	5
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	1	0	7	0	4	0	0	24
New York	5	0	2	1	48	6	53	1	78	0	4	89
Rochester	0	0	------	0	0	0	2	0	4	0	0	7
Syracuse	0	0	------	0	11	1	2	1	5	0	0	2
New Jersey:												
Camden	0	0	------	0	0	0	1	0	1	0	0	4
Newark	0	0	------	0	2	0	4	0	4	0	1	41
Trenton	0	0	------	0	0	0	1	0	1	0	0	0
Pennsylvania:												
Philadelphia	2	0	6	0	16	1	16	1	34	0	1	61
Pittsburgh	0	0	4	2	0	1	7	4	19	0	0	5
Reading	0	0	------	0	2	0	2	0	0	0	0	8
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	2	1	0	9	0	15	0	0	10
Cleveland	0	0	4	0	2	0	5	2	19	0	0	29
Columbus	6	0	------	0	0	0	2	0	8	0	0	2
Indiana:												
Fort Wayne	0	0	------	0	0	0	1	0	2	0	0	0
Indianapolis	1	0	------	0	1	0	6	0	7	0	1	3
South Bend	0	0	------	0	0	0	0	0	1	0	0	0
Terre Haute	0	0	------	0	0	0	0	0	0	0	0	0
Illinois:												
Chicago	2	0	1	1	153	4	22	3	44	0	0	59
Springfield	0	0	------	0	0	0	0	0	4	0	0	3
Michigan:												
Detroit	3	3	------	1	28	4	12	0	37	0	0	69
Flint	0	0	------	0	23	0	0	0	9	0	0	2
Grand Rapids	0	0	------	0	3	0	1	1	3	0	1	15
Wisconsin:												
Milwaukee	0	0	1	1	2	1	4	1	16	0	0	23
Racine	0	0	------	0	0	0	0	0	3	0	0	1
Superior	0	0	------	0	1	0	0	0	0	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	0	0	0	0	4	0	0	1
Minneapolis	3	0	------	0	3	0	2	1	9	0	0	5
Missouri:												
Kansas City	2	0	------	0	8	0	7	0	5	0	0	3
St. Joseph	0	0	------	0	4	0	0	0	3	0	0	0
St. Louis	0	0	7	0	2	0	9	14	8	0	0	2

See footnotes at end of table.

City reports for week ended November 17, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	1	1	0	5	1	6	0	0	0
Kansas:												
Topeka	0	0	------	0	0	0	0	0	6	0	0	3
Wichita	0	0	------	0	0	1	8	0	6	0	0	1
SOUTH ATLANTIC:												
Delaware:												
Wilmington	0	0	------	0	0	0	2	0	0	0	0	1
Maryland:												
Baltimore	6	0	2	2	1	1	9	1	17	0	2	21
Cumberland	0	0	------	0	0	0	0	0	0	0	0	0
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	0	0	------	0	0	0	3	5	12	0	0	2
Virginia:												
Lynchburg	0	0	------	0	0	0	1	0	3	0	0	0
Richmond	1	0	------	0	1	1	3	0	9	0	0	0
Roanoke	1	0	------	0	0	0	0	0	3	0	0	0
West Virginia:												
Wheeling	0	0	------	0	0	0	0	0	14		0	0
North Carolina:												
Wilmington	0	0	------	0	0	0	0	0	3	0	0	1
Winston-Salem	0	0	------	0	0	0	0	0	3	0	0	2
South Carolina:												
Charleston	0	0	24	0	0	1	2	0	2	0	0	0
Georgia:												
Atlanta	3	0	14	0	0	0	5	0	9	0	0	3
Brunswick	0	0	------	0	0	0	0	0	1	0	0	0
Florida:												
Tampa	1	0	------	0	0	0	2	0	0	0	0	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	1	1	0	0	5	2	2	0	0	5
Nashville	0	0	------	0	0	0	2	2	3	0	0	0
Alabama:												
Birmingham	4	0	3	0	0	0	5	0	4	0	1	0
Mobile	4	0	------	1	0	1	0	0	1	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	0	0	0	0	1	0	0	0
Louisiana:												
New Orleans	12	0	2	2	4	3	3	3	15	0	2	1
Shreveport	1	0	------	0	0	0	3	1	0	0	0	0
Texas:												
Dallas	5	0	------	0	1	0	3	0	11	0	0	1
Galveston	0	0	------	0	0	0	0	0	0	0	0	0
Houston	3	0	------	1	0	0	4	0	5	0	0	0
San Antonio	1	0	------	0	1	0	5	1	1	0	0	0
MOUNTAIN												
Montana:												
Billings	0	0	------	0	0	0	1	0	2	0	1	0
Great Falls	0	0	------	0	0	0	0	0	0	0	0	0
Helena	0	0	------	0	0	0	0	0	1	0	0	0
Missoula	0	0	------	0	5	0	2	0	0	0	0	0
Idaho:												
Boise	0	0	------	0	0	0	0	0	1	0	0	0
Colorado:												
Denver	1	0	2	1	2	0	4	1	8	0	1	14
Pueblo	1	0	------	0	0	0	0	0	7	0	0	3
Utah:												
Salt Lake City	0	0	------	0	3	0	0	0	3	0	0	3

City reports for week ended November 17, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	0	50	0	2	5	5	0	1	12
Spokane	0	0	------	0	0	0	1	1	3	0	0	1
Tacoma	0	0	------	0	53	0	1	3	2	0	0	1
California:												
Los Angeles	3	0	------	3	13	1	4	10	25	0	1	3
Sacramento	0	0	------	0	2	0	1	0	5	0	0	3
San Francisco	0	0	------	0	47	0	10	3	13	0	2	6
Total	77	3	73	20	512	30	305	85	601	0	20	628
Corresponding week, 1944	102	------	44	20	219	------	371	------	836	0	11	495
Average, 1940–44	89	------	121	[1] 27	[2] 690	------	[1] 367	------	730	1	17	924

[1] 3-year average, 1942–44.
[2] 5-year median, 1940–44.

Dysentery, amebic.—Cases: New York, 2; Chicago, 2; St. Louis, 2; Los Angeles, 1.
Dysentery, bacillary.—Cases: New York, 6; Rochester, 1; Detroit, 3; Charleston, S. C., 6; Nashville, 1; Los Angeles, 1.
Tularemia.—Cases: New Orleans, 1.
Typhus fever, endemic.—Cases: Atlanta, 8; Nashville, 4; Birmingham, 1; Mobile, 1; New Orleans, 3; Dallas, 2; Houston, 1; Los Angeles, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 84 cities in the preceding table (estimated population, 1943, 33,798,600)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	5.2	0.0	0.0	0.0	44	7.8	88.9	44.4	97	0.0	2.6	193
Middle Atlantic	3.2	0.0	5.6	1.4	37	4.2	44.0	3.2	69	0.0	2.8	112
East North Central	8.6	1.8	3.7	3.1	131	5.5	37.9	4.3	103	0.0	1.2	133
West North Central	13.5	0.0	15.8	2.3	41	2.3	69.9	36.1	106	0.0	0.0	34
South Atlantic	21.2	0.0	70.7	3.5	4	5.3	47.7	10.6	143	0.0	3.5	53
East South Central	53.1	0.0	23.6	11.8	0	5.9	70.8	23.6	59	0.0	5.9	30
West South Central	63.1	0.0	5.7	8.6	17	8.6	51.7	14.3	95	0.0	5.7	6
Mountain	15.9	0.0	15.9	7.9	79	0.0	55.6	7.9	175	0.0	15.9	135
Pacific	4.7	0.0	0.0	4.7	261	1.6	30.0	34.8	84	0.0	6.3	41
Total	11.9	0.5	11.3	3.1	79	4.6	47.2	13.1	93	0.0	3.1	97

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 3, 1945.—During the week ended November 3, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		12	2	105	224	59	53	83	64	602
Diphtheria	2	5	5	60	3	5				80
Dysentery, bacillary				2						2
German measles				3	12		1	2	5	23
Influenza		4			6					10
Measles		3	1	140	277	2	2	19	156	600
Meningitis, meningococcus		1		1		1				3
Mumps				59	53	24	4	45	16	201
Poliomyelitis					2	1			2	5
Scarlet fever	15	15	11	92	81	15	4	20	15	268
Tuberculosis (all forms)		11	2	70	58	12		12	68	233
Typhoid and paratyphoid fever				15	1	1		1	1	19
Undulant fever				5	1					6
Venereal diseases:										
Gonorrhea		26	19	106	229	64	26	55	66	591
Syphilis		11	8	109	183	11	12	18	26	378
Whooping cough		12	4	140	11	4		12		183

FINLAND

Notifiable diseases—September 1945.—During the month of September 1945, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	21	Paratyphoid fever	1,953
Chickenpox	183	Pneumonia	1,058
Conjunctivitis	19	Poliomyelitis	218
Diphtheria	1,614	Puerperal fever	42
Dysentery, unspecified	67	Rheumatic fever	331
Gastroenteritis	6,488	Scabies	4,242
Gonorrhea	2,035	Scarlet fever	197
Hepatitis, epidemic	1,088	Syphilis	509
Influenza	498	Tetanus	1
Laryngitis	36	Typhoid fever	103
Malaria	31	Vincent's angina	33
Measles	32	Whooping cough	1,094
Mumps	144		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Bolivia—Santa Cruz Department—Province of Cordillera—Lagunillas.—During the month of September 1945, 4 cases of plague were reported in Lagunillas, Province of Cordillera, Santa Cruz Department, Bolivia.

Union of South Africa—Transvaal—Pretoria.—During the week ended November 10, 1945, 1 case of plague was reported in Pretoria, Transvaal, Union of South Africa.

Smallpox

Bolivia.—For the month of October 1945, 166 cases of smallpox with 24 deaths were reported in Bolivia. The Departments reporting the highest incidence are: La Paz, 76 cases, 15 deaths; Cochabamba, 29 cases, 4 deaths; Beni, 18 cases, 1 death.

British East Africa—Tanganyika.—For the week ended October 13, 1945, 228 cases of smallpox with 33 deaths were reported in Tanganyika, British East Africa.

Peru.—For the month of September 1945, 37 cases of smallpox, including 26 cases in Lima Department, were reported in Peru.

Venezuela.—For the month of October 1945, 82 cases of smallpox with 1 death were reported in Venezuela. States reporting the highest incidence are: Federal District, 11 cases; Sucre, 36; Aragua, 22 cases, 1 death.

Typhus Fever

Bolivia.—For the month of October 1945, 43 cases of typhus fever with 20 deaths were reported in Bolivia. Departments reporting the highest incidence are: La Paz, 21 cases, 9 deaths; Potosi, 12 cases, 7 deaths; Chuquisaca, 5 cases, 1 death; Cochabamba, 4 cases, 2 deaths.

Guatemala.—For the month of September 1945, 515 cases of typhus fever with 48 deaths were reported in Guatemala.

Peru.—For the month of September 1945, 57 cases of typhus fever were reported in Peru. Departments reporting the highest incidence are: Cuzco, 24; Puno, 13; Junin, 6; Huancavelica, 6.

Yellow Fever

British Guiana—Kwakwani.—On September 24, 1945, 1 death from yellow fever occurred in Kwakwàni, in the Berbice River district, British Guiana. The date of onset was September 15, 1945, in a forest 15 miles from Kwakwani.

Sudan (French)—Bamako.—On October 18, 1945, 1 case of suspected yellow fever with 1 death was reported in Bamako, French Sudan.

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