PUBLIC HEALTH REPORTS

VOL. 51 JANUARY 10, 1936 NO. 2

CULTIVATION OF THE VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS IN THE DEVELOPING CHICK EMBRYO

By IDA A. BENGTSON, *Senior Bacteriologist* and J. G. WOOLEY, *Acting Assistant Surgeon, United States Public Health Service*

The chorio-allantoic membrane of the chick embryo has been found suitable as a medium for the cultivation of a considerable number of the filterable viruses and also for the rickettsiae of Rocky Mountain fever and endemic typhus fever. The rapidly developing cellular structure of the membrane is often favorable for growth, although the hatched chick or the adult fowl may be resistant to the disease, as is true of the viruses of herpes simplex, equine encephalomyelitis and other diseases.

The ready susceptibility of a number of laboratory animals to the virus of lymphocytic choriomeningitis as reported by Armstrong and Lillie (*1*) suggested the possibility that the chick embryo by inoculation of the chorio-allantoic membrane might also be susceptible. This was found to be the case, and the virus was continued through eight passages in the egg without great difficulty. The possibility was considered whether the virus might be more concentrated in the embryo than in other susceptible animals, and it was also thought that some information might be gained in regard to the nature of the virus by a microscopic study of the cells of the chorio-allantoic membrane.

The technique of inoculation and transfer of the virus was similar to that used for the cultivation of the virus of Rocky Mountain spotted fever by the senior author (*2*) except that brain material as well as membrane were used in making the transfers.

THE VIRUS USED FOR INITIATING GROWTH

In the first two series of eggs, mouse brains in the thirty-fifth and thirty-seventh generations of the virus were used for initiating growth. These were taken on the seventh day following inoculation of the mice, when well developed symptoms were in evidence. As described by Armstrong and Lillie, a pronounced tremor and a tendency to spastic convulsion are the most conspicuous symptoms in mice. The titrations of these viruses in mice are shown in table 1. Both were virulent in dilutions of 1×10^{-4}.

TABLE 1.—*Titrations of viruses (mouse brains) used for initiating growth in the chick embryos*

Virus	Serial passage in mice	Dilutions of mouse brain	Mice inoculated intracerebrally	
			Died	Survived
E 35	35th	1×10^{-2}	4 (7, 7, 7, 13)[1]	0
		1×10^{-3}	4 (7, 8, 9, 9)	0
		1×10^{-4}	1 (9)	3
		1×10^{-5}	0	4
E 37	37th	1×10^{-1}	4 (7, 7, 7, 7)	0
		1×10^{-2}	4 (6, 6, 6, 7)	0
		1×10^{-3}	4 (6, 6, 7, 7)	0
		1×10^{-4}	3 (7, 8, 9)	1

[1] The figures in parentheses indicate days on which the death of mice occurred.

The brains were weighed and diluted with a volume of sterile 0.85-percent buffered salt solution equal to 10 times the weight of the brain in grams. This was designated as 1×10^{-1} dilution. Further dilutions were made from this, at times up to 1×10^{-5} or 1×10^{-6}. The inoculum used for the chick embryos was 0.1 cc, this amount being inoculated with a hypodermic syringe through the sterile vaseline with which a sterile coverslip was held in place over a triangular opening in the egg shell. Fertile eggs previously incubated 11 or 12 days at 39.5° C. were used in the tests. The period of incubation after inoculation was uniformly 7 days, and the temperature of incubation 37.5° C.

SERIAL PASSAGE OF THE VIRUS

In the first series of eggs the dilutions of the mouse brain ranging from 1×10^{-1} to 1×10^{-6} were each inoculated on the chorio-allantoic membrane of three eggs. The brain and some of the membrane from one of each group of three eggs were tested on mice. Both the brain and the membrane of the embryos inoculated with dilutions ranging from 1×10^{-1} to 1×10^{-5} produced positive symptoms in mice, while negative results were obtained with the 1×10^{-6} dilution. The results indicate high susceptibility of the embryo to the virus and that the virus was present in about the same concentration in the membrane and in the brain (table 2).

TABLE 2.—*Growth of the virus in the chick embryo*

[Virus A 35. Date: May 8, 1935]

Dilutions of mouse brain used for inoculating embryos	Numbers of eggs	Number of embryo used for mouse tests	Dilutions of embryo brains used for mice	Mice inoculated		Dilutions of embryo membranes used for mice	Mice inoculated	
				Died	Survived		Died	Survived
1×10^{-6}	1 to 3	1	1×10^{-1}	0	2	1×10^{-1}	0	3
1×10^{-5}	4 to 6	4	1×10^{-1}	2 (6, 6)[1]	0	1×10^{-1}	2 (5, 12)[1]	1
1×10^{-4}	7 to 9	8	1×10^{-1}	2 (8, 8)	0	1×10^{-1}	3 (4, 8, 8)	0
1×10^{-3}	10 to 12	11	1×10^{-1}	2 (8, 8)	0	1×10^{-1}	2 (1[1], 12)	1
1×10^{-2}	13 to 15	14	1×10^{-1}	2 (8, 9)	0	1×10^{-1}	3 (8, 9, 9)	0
1×10^{-1}	16 to 18	17	1×10^{-1}	2 (10, 14)	0	1×10^{-1}	3 (1, 4, 10)	0

[1] Figures in parentheses indicate days on which death occurred.

The virus was continued through a second series of eggs for eight passages during the period from June 5 to July 31, 1935. The passage of the virus was carried out with brain material during the first five generations and then with both brain and membrane during the sixth to eighth generations (table 3).

TABLE 3.—*Serial passage of the virus in the chick embryo*

Date	Generation	Number of the embryo used for passage of virus	Dilutions of mouse brain virus used for inoculating embryos	Numbers of eggs inoculated	Number of the embryo used for mouse test	Dilutions of embryo brain	Mice inoculated		Dilutions of embryo membrane	Mice inoculated	
							Died	Survived		Died	Survived
June 5, 1935	1		1×10^{-4}	1 to 6	9	1×10^{-3}	2 (9, 10)[1]	2			
			1×10^{-3}	7 to 12		1×10^{-2}	4 (7, 7, 8, 8)	0			
			1×10^{-2}	13 to 18		1×10^{-1}	3 (7, 7, 10)	1			
			Dilutions of embryo virus used for inoculating embryos								
					15	1×10^{-3}	4 (7, 7, 7, 8)	0			
						1×10^{-2}	4 (7, 7, 7, 9)	0			
						1×10^{-1}	4 (7, 7, 7, 8)	0			
June 12, 1935	2	9 (brain)	1×10^{-3}	19 to 21	24	1×10^{-3}	4 (7, 7, 8, 9)	0			
			1×10^{-2}	22 to 24		1×10^{-2}	4 (2, 2, 7, 7)	0			
			1×10^{-1}	25 to 27		1×10^{-1}	4 (1, 2, 2, 8)	0			
		15 (brain)	1×10^{-3}	28 to 30	33	1×10^{-3}	4 (7, 7, 8, 10)	0			
			1×10^{-2}	31 to 33		1×10^{-2}	4 (6, 6, 7, 7)	0			
			1×10^{-1}	34 to 36		1×10^{-1}	3 (7, 7, 7)	0			
June 19, 1935	3	33 (brain)	1×10^{-3}	37 to 39	45	1×10^{-3}	0	4			
			1×10^{-2}	40, 41		1×10^{-2}	0	4			
			1×10^{-1}	42, 43		1×10^{-1}	0	4			
		24 (brain)	1×10^{-3}	44, 45	47	1×10^{-3}	0	4			
			1×10^{-2}	46, 47		1×10^{-2}	3 (1, 7, 9)	1			
			1×10^{-1}	48, 49		1×10^{-1}	4 (0, 7, 10, 10)	0			
June 26, 1935	4	45 (brain)	1×10^{-3}	54, 55	50	1×10^{-1}	1 (1)	2			
			1×10^{-2}	52, 53							
			1×10^{-1}	50, 51							
					56	1×10^{-3}	2 (8, 9)	1			
						1×10^{-2}	3 (6, 8, 8)	0			
						1×10^{-1}	3 (2, 6, 6)	0			
		47 (brain)	1×10^{-2}	60, 61	58	1×10^{-3}	0	3			
			1×10^{-2}	58, 59		1×10^{-2}	0	3			
			1×10^{-1}	56, 57		1×10^{-1}	0	3			
					30	1×10^{-1}	3 (7, 7, 7)	0			
July 3, 1935	5	56 (brain)	1×10^{-2}	62 to 67	63	1×10^{-1}	3 (6, 6, 7)	0	1×10^{-1}	3 (6, 6, 7)	0.
			1×10^{-2}	68 to 73	70	1×10^{-1}	3 (0, 7, 8)	0	1×10^{-1}	3 (0, 7, 8)	0.
			1×10^{-1}	74 to 78	76	1×10^{-3}	3 (7, 7, 7)	0	1×10^{-3}	3 (1, 6, 6)	0.
									1×10^{-2}	3 (7, 7, 8)	0.
									1×10^{-1}	2 (6, 6)	1.
									1×10^{-3}	0	3.
July 10, 1935	6	76 (membrane)	1×10^{-2}	79 to 81	83				1×10^{-4}	1 (8)	2.
			1×10^{-2}	82 to 84					1×10^{-3}	3 (5, 7, 8)	0.
			1×10^{-1}	85 to 87					1×10^{-2}	3 (3, 3, 7)	0.
									1×10^{-1}	3 (6, 6, 6)	0.

		76 (brain)	1×10^{-3}	88 to 90	91	1×10^{-5}	0	3			
			1×10^{-2}	91 to 93		1×10^{-4}	1 (8)	2			
			1×10^{-1}	94 to 96		1×10^{-3}	3 (2, 7, 8)	0			
						1×10^{-2}	3 (6, 7, 8)	0			
						1×10^{-1}	3 (3, 6, 6)	0			
			1×10^{-5}	97 to 99	108				1×10^{-5}	1 (5)	2
			1×10^{-4}	100 to 102					1×10^{-4}	0	3
July 17, 1935	7	83 (membrane)	1×10^{-3}	103 to 105					1×10^{-3}	0	3
			1×10^{-2}	106 to 108					1×10^{-2}	2 (9, 9)	1.
			1×10^{-1}	109 to 111					1×10^{-1}	3 (7, 8, 10)	0.
					124	1×10^{-5}	0	3			
						1×10^{-4}	0	3			
			1×10^{-5}	112 to 114		1×10^{-3}	1 (0)	2			
			1×10^{-4}	115 to 117		1×10^{-2}	2 (7, 13)	1			
		91 (brain)	1×10^{-3}	118 to 120		1×10^{-1}	1 (7)	2[2]			
			1×10^{-2}	121 to 123	114	1×10^{-1}	0	3			
			1×10^{-1}	124 to 126	117	1×10^{-1}	0	3			
					120	1×10^{-1}	0	3			
					125	1×10^{-1}	3 (6, 6, 6)	0			
					122[3]	1×10^{-1}	3 (0, 7, 7)	0			
			1×10^{-5}	127, 128	127				1×10^{-1}	1 (0)	2.
			1×10^{-4}	129, 130	129				1×10^{-1}	0	3.
July 24, 1935	8	108 (membrane)	1×10^{-3}	131, 132	131				1×10^{-1}	1 (1)	2.
			1×10^{-2}	133, 134	133				1×10^{-1}	0	3.
			1×10^{-1}	135, 136	136				1×10^{-4}	3 (1, 1, 8)	0.
			1×10^{-5}	137, 138	137	1×10^{-1}	0	3			
			1×10^{-4}	139, 140	139	1×10^{-1}	0	3			
		122 (brain)	1×10^{-3}	141, 142	141	1×10^{-1}	3 (7, 7, 8)	0			
			1×10^{-2}	143, 144	143	1×10^{-1}	0	3			
			1×10^{-1}	145, 146[4]							

[1] Figures in parentheses indicate days on which death occurred.
[2] Symptoms.
[3] Liver.
[4] Both embryos died

In figure 1 is presented a diagram showing only the embryos with which passage was continued and the dilutions used for each passage.

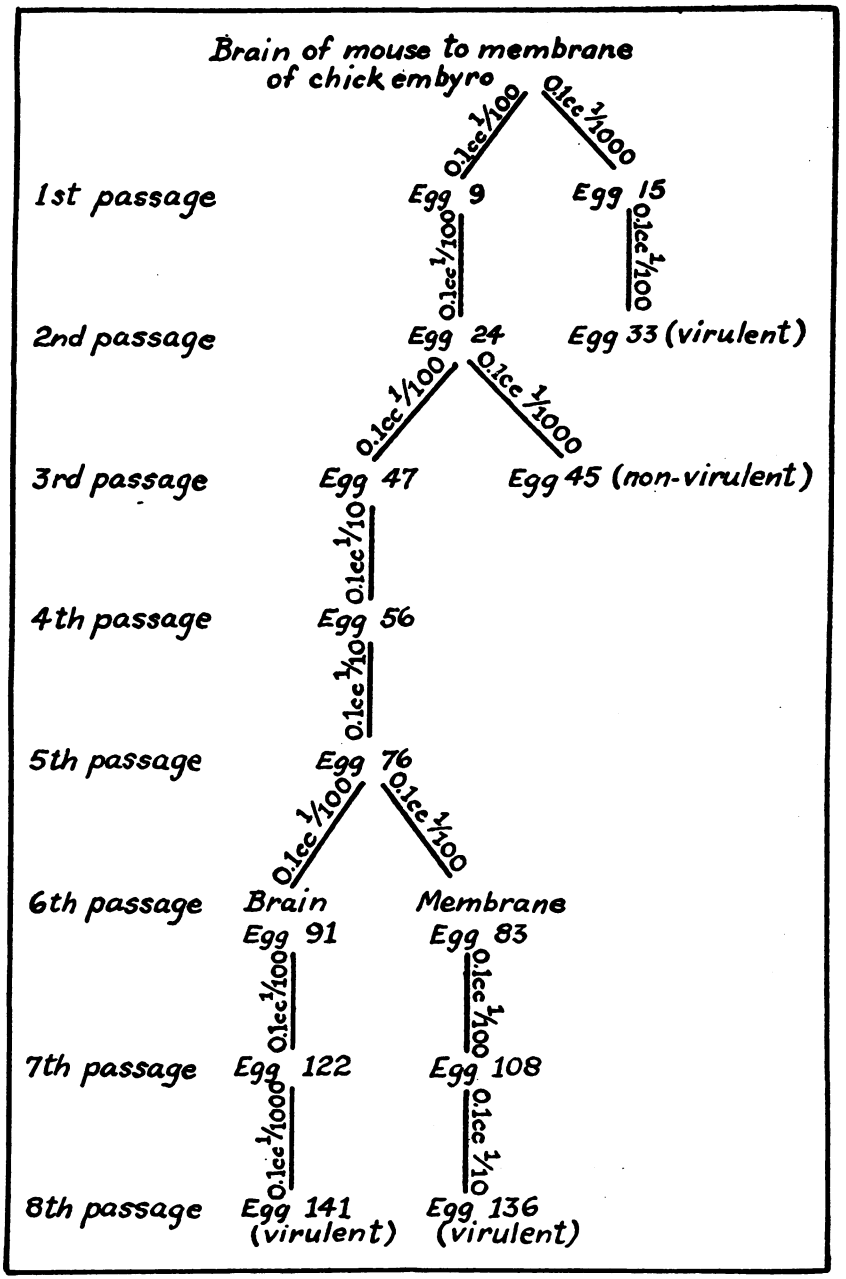

FIGURE 1.--Diagram showing the embryos with which passage was continued and the dilutions used for each passage.

A computation of the total dilution indicates that the virus in embryo 141 (brain) was present in a dilution of at least 1×10^{-23} of the original

virus and in embryo 136 (membrane) in a dilution of at least 1×10^{-21}. The virus is not confined to the membrane and the brain, and therefore the dilution is much higher than that indicated by the figures.

The membranes and brains of the embryos were usually tested by the intracerebral inoculation of mice in several different dilutions. In most cases they were infective in dilutions of 1×10^{-3}, using 0.03 cc of this dilution for inoculating the mice intracerebrally. In the sixth generation a 1×10^{-4} dilution of the brain and membrane of the embryos were both infective for one out of three mice in each case. In a few cases there seemed to be a "pre-zone" in the activity of the virus, some of the animals receiving the 1×10^{-1} dilution failing to develop as definite symptoms or even surviving the inoculation, while those on the 1×10^{-2} and 1×10^{-3} dilutions reacted characteristically.

Judging from the titrations made on mice there was apparently some variation in the strength of the virus from generation to generation. Considering the results as a whole, however, there certainly was no evidence that the virus increased in virulence for the embryo. The number of negative results obtained toward the end of the series indicate rather a decrease in virulence.

The virus is probably more virulent for the mouse than for the chick embryo, as the embryos as a rule survived longer. Mice usually died on the seventh day following inoculation. There were always living embryos from which to continue the virus passage at this time. There was, however, some evidence that the virus killed the embryos on the ninth and tenth days, as a number were found dead on those days following inoculation.

CONFIRMATION OF THE VIRUS

The symptoms and pathology produced in mice and the period of survival after inoculation were characteristic of lymphocytic choriomeningitis. Embryo membrane virus of the sixth generation was used in the test for the confirmation of the virus. Dilutions of $\frac{1}{33}$, $\frac{1}{333}$, and $\frac{1}{1000}$ of the virus were made with 0.85 percent sodium chloride and inoculated intracerebrally into white mice, using 3 mice for each dose. Two of the mice inoculated with the $\frac{1}{33}$ dilution, 2 with the $\frac{1}{333}$, and 1 with the $\frac{1}{1000}$ dilution died from the seventh to the fourteenth day following inoculation, with symptoms commonly seen in mice inoculated with the lymphocytic choriomeningitis virus. The remaining mouse inoculated with the $\frac{1}{333}$ dilution, ill with characteristic symptoms, was etherized *in extremis* and was used in the mouse-protection tests with blood serum of one convalescent monkey that had recovered after being inoculated with virus of lymphocytic choriomeningitis, with blood serum from a human convalescent from clinically diagnosed lymphocytic choriomeningitis, and with sera from two normal monkeys. Each of the convalescent sera contained antibodies which

protected the mice from clinical manifestations of the disease, while mice receiving virus plus sera from normal monkeys received slight if any protection against the virus. A protocol of the test is shown in table 4.

TABLE 4.—*Confirmation of the virus*

Virus plus 2 parts of—	Dilution of virus	Mice inoculated	
		Died	Survived
Convalescent monkey serum	1/33	1 (10) [1]	3
	1/333	0	4
	1/1000	0	4
Convalescent human serum	1/33	1 (9)	3
	1/333	1 (9)	3
	1/1000	0	4
Normal monkey serum	1/33	4 (7, 7, 8, 9)	0
	1/333	4 (8, 8, 9, 9)	0
	1/1000	1 (13)	3
Normal monkey serum	1/33	4 (8, 8, 8, 8)	0
	1/333	1 (10)	3
	1/1000	1 (5)	3

[1] Figures in parentheses indicate days on which death occurred.

As further confirmation of the virus, the brain of a mouse which had received virus plus normal monkey serum and which had died during the test was removed and examined in the division of pathology of this laboratory, where the diagnosis of lymphocytic choriomeningitis was made.

DISTRIBUTION OF THE VIRUS IN THE EMBRYO

It is probable that the virus was distributed throughout the embryo. In the tests, as carried out, the infectivity of the membrane and of the brain often seemed to run a parallel course, as they were infective in the same dilutions. In the seventh generation the livers of two of the embryos when inoculated into mice produced characteristic symptoms and caused the death of the mice in 5 to 8 days. In the eighth generation the filtrate of the amniotic fluid containing also blood was infectious for mice.

THE LESION

There was no such marked lesion at the site of inoculation as occurred in the case of Rocky Mountain spotted fever (Bengtson and Dyer). There was a slight thickening of the membrane, and in some cases there were small, discrete, irregular cloudy areas which were below the surface of the ectodermal layer. The histological studies of the membranes and also of the embryos are reported separately by Dr. Lillie.[1]

[1] See the following article.—Ed.

EXPERIMENTS WITH THE FILTERED VIRUS

Three experiments were made with filtered virus. In conducting these experiments, macerated infected mouse brains were suspended in sterile buffered salt solution and the suspensions centrifuged for 10 to 15 minutes at low speed to precipitate the heavier particles. A portion of the supernatant fluid was then filtered through Berkefeld N candles and the filtrate centrifuged at high speed (15,000 revolutions per minute) for 30–45 minutes. A very slight precipitate was discernible in the tubes after centrifuging.

The low-speed supernatant fluid, the high-speed supernatant fluid, and a suspension of the high-speed precipitate from the filtrate were tested by the intracerebral inoculation of mice to determine the concentration of the virus in the various portions. In attempting to infect the embryos the suspension of the high-speed centrifugate only was used.

In the first experiment the high-speed centrifugate was virulent for mice, but negative results were obtained in the chick embryos as determined by the inoculation of embryo material into mice. In the second experiment the high-speed centrifugate was nonvirulent, and consequently the embryos were not tested for virulence. In the third experiment the high-speed centrifugate was virulent for both mice and embryos. Typical symptoms followed by death occurred in mice inoculated with the embryo material.

The titrations of the virus used for inoculating the chick embryos in the first experiment are shown in table 5. The results indicate a definite concentration of the virus by high-speed centrifugation. The high speed centrifugate was virulent for mice in a dilution up to 1×10^{-6}, while the supernatant fluid was virulent in a dilution of only 1×10^{-1}. The unfiltered suspension was virulent in a dilution of 1×10^{-2} or possibly 1×10^{-3}.

TABLE 5.—*Titration of high speed centrifugate of mouse brain virus E 54*

SUSPENSION OF HIGH SPEED CENTRIFUGATE

Dilutions	Mice inoculated	
	Died	Survived
1×10^{-1}	3 (1, 6, 7)	0
1×10^{-2}	3 (6, 7, 7)	0
1×10^{-3}	3 (7, 7, 7)	0
1×10^{-4}	3 (7, 7, 8)	0
1×10^{-5}	3 (1, 8, 8)	0
1×10^{-6}	2 (8, 9)	1

TABLE 5.—*Titration of high speed centrifugate of mouse brain virus E 54*—Contd.

TITRATION OF SUPERNATANT FLUID OF HIGH SPEED CENTRIFUGATE

Dilutions	Mice inoculated	
	Died	Survived
Original	1 (1)	2
1×10^{-1}	2 (7, 8)	1
1×10^{-2}	2 (1, 1)	1
1×10^{-3}	2 (2, 6)	1

TITRATION OF SUPERNATANT FLUID OF LOW SPEED CENTRIFUGATE

Dilutions	Mice inoculated	
	Died	Survived
1×10^{-1}	3 (6, 7, 8)	0
1×10^{-2}	3 (0, 1, 7)	0
1×10^{-3}	3 (4, 4, 4)	0
1×10^{-4}	1 (0)	2
1×10^{-5}	0	3

The titration of the virus used in the third experiment is shown in table 6. In this case the high speed centrifugate was virulent in a dilution up to 1×10^{-3} while the supernatant fluid was virulent in a dilution up to 1×10^{-1}. The virus was apparently not concentrated to the extent that it was in the preceding case.

TABLE 6.—*Titration of high-speed centrifugate of mouse brain virus E 56*

Dilutions	Suspension of high-speed centrifugate		Supernatant fluid of high-speed centrifugate	
	Mice inoculated		Mice inoculated	
	Died	Survived	Died	Survived
Undiluted[a]			3 (6, 6, 7)	0
1×10^{-1}	6 (6, 6, 6, 7, 7, 7)	0	3 (7, 7, 7)	0
1×10^{-2}	3 (6, 7, 7)	0	0	3
1×10^{-3}	3 (3, 6, 6)	0	0	3
1×10^{-4}	1 (1)	2	1 (2)	2
1×10^{-5}	1 (7)	2		
1×10^{-6}	1 (1)	2		

In the third experiment chick embryos were inoculated with the 1×10^{-1} and 1×10^{-2} dilutions of the high-speed centrifugate. After 1 week's incubation the brains and membranes of the embryos which survived were tested for virulence by the intracerebral inoculation of mice. The results are shown in table 7. It is indicated that the virus multiplied or at least survived on the chorio-allantoic membrane. In all three groups, mice inoculated with the membranes developed symptoms and died on the sixth or seventh day. In the case of the

mice inoculated with the brains from the embryos, symptoms developed more slowly, but the results were definite and conclusive in the case of some of the embryos. Apparently the virus was present in a less concentrated form in the brain than in the membrane of the embryo.

TABLE 7.—*Results of inoculation of chick embryos with the high-speed centrifugate of a filtrate of lymphocytic choriomeningitis virus*

Nos. of chick embryos	Dilutions of material used for inoculations	Mice inoculated with—			
		Membranes		Brains	
		Died	Survived	Died	Survived
1	1×10^{-1}	2 (7, 7)	1	2 (0, 7)	1
	1×10^{-2}	3 (6, 6, 7)	0	2 (0, 2)	1
10, 11	1×10^{-1}	3 (6, 6, 7)	0	3 (8, 9, 9)	0
	1×10^{-2}	3 (6, 6, 6)	0	3 (0, 3, 8)	0
14, 15, 19	1×10^{-1}	3 (0, 4, 6)	0	1 (6)	2
	1×10^{-2}	3 (3, 6, 7)	0	2 (2, 5)	1

The virus was continued through three passages in the chick embryo, and it is probable that propagation could be continued further in the same way as that initiated by the unfiltered material.

EFFECT OF THE VIRUS ON THE HATCHED CHICK

It seemed of interest to determine whether chicks hatched from embryos which had been inoculated with the virus would show any evidence of the effect of the virus, and also to determine whether chicks inoculated with the virus several days after hatching would show any effects.

In order to determine the effect on the chick of virus inoculation prior to hatching, 21 fertile eggs which had been incubated for 13 days were inoculated with a suspension of four infected mouse brains. The same number of uninoculated fertile eggs served as controls. Nine of the inoculated eggs and 6 of the uninoculated hatched. There was a rather marked difference in the appearance of the two groups of chicks which was more apparent on the second or third day after hatching. The chicks of the inoculated group were definitely less active, the down had a roughened appearance, and the eyes appeared somnolent. However, all of these except one apparently recovered, and in a short time they appeared as healthy as the uninoculated group. The one exception was a chick which had a very marked deformity of the legs which it was considered might be evidence of pronounced symptoms of lymphocytic choriomeningitis. This chick was etherized and a suspension made of the brain for titration in mice. Mice were also inoculated intracerebrally with

some of the heart blood and with suspensions of the liver and heart muscle. None of the mice developed symptoms or died as the result of the inoculation. It may therefore be inferred that the virus was not present in the chick, or at least it was not present in sufficiently high dilution to produce symptoms in mice.

In order to determine the effect of the virus on the hatched chicks, tests were made with filtered and unfiltered virus. A suspension of the virus contained in three mouse brains was prepared. A portion of this was subjected to low-speed centrifugation, followed by filtration through a Berkefeld filter and high-speed centrifugation. One group of five 3-day-old chicks was inoculated with unfiltered suspension of the virus, another group of 5 with the high-speed centrifugate, and a third group of 3 with the same volume of buffered salt solution. The virus used for inoculating the chicks was titrated on mice, using a dose half as large as that used for the chicks. These mice developed typical symptoms and died on the sixth day. None of the chicks showed any symptoms on the sixth day, and all continued to remain normal thereafter. Apparently, therefore, the virus was not virulent for the hatched chick, at least not with the doses used.

MICROSCOPICAL STUDIES

Impression smears of the membranes and organs of the embryos and preparations from the high-speed centrifugate of the filtrate of mouse and embryo brains stained with Giemsa and Victoria blue (*3*) failed to reveal the presence of any definitely formed bodies resembling elementary bodies, nor were any inclusion bodies observed.

SUMMARY

The virus of lymphocytic choriomeningitis was cultivated through eight passages in the chorio-allantoic membrane and in the brain of the chick embryo.

The chick embryos inoculated with virus survived longer than mice inoculated with the virus, indicating greater resistance on the part of the embryo to the virus.

The virus was present to approximately the same extent in the membrane and the brain of the embryo. It was also present in the liver and the amniotic fluid.

The lesion produced at the site of inoculation was relatively insignificant.

REFERENCES

(1) Armstrong, Chas., and Lillie, R. D.: Experimental lymphocytic choriomeningitis of monkeys and mice produced by a virus encountered in studies of the 1933 St. Louis encephalitis epidemic. Pub. Health Rep., 49: 1019–1027 (1934).

(2) Bengtson, Ida A., and Dyer, R. E.: Cultivation of the virus of Rocky Mountain spotted fever in the developing chick embryo. Pub. Health Rep., 50: 1489–1498 (1935).
(3) Herzberg, K.: Viktoriablau zur Färbung von filtrierbaren Virus (Pocken-, Varizellen-, Ektromelia- und Kanarienvogelvirus). Zentralbl. Bakt., Orig., 131: 358–366 (1934).

HISTOPATHOLOGIC REACTION TO THE VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS IN THE CHICK EMBRYO

By R. D. Lillie, *Surgeon, United States Public Health Service*

Following the same plan as that described in the previously reported study on the reaction in the chick embryo to the virus of Rocky Mountain spotted fever (*1*, *2*), tissues were studied from nine chick embryos from the concurrently reported experiments of Bengtson and Wooley (*3*).

The fetal membranes presented inconstantly an irregular edema and sparse to moderate irregular infiltration by pseudo-eosinophil leucocytes. Nodules of myelocytes more or less mixed with lymphocytes were present in most of the birds. Vascular proliferative reactions were absent.

The skin presented a variable amount of focal cellular infiltration, chiefly in the head region, in most of the animals. The infiltration was composed of variable proportions of pseudo-eosinophil leucocytes, myelocytes, and lymphocytes.

A focal infiltration by varying proportions of myelocytes, leucocytes, and lymphocytes was often seen in the buccopharyngeal mucosa. The mucosae of the esophagus and proventriculus usually showed no significant lesions, and those of the gizzard and intestines were regularly normal. The musculature and once the serosa of the gizzard showed a focal myelocyte infiltration in 3 of 6 birds, in 1 mixed with lymphocytes.

The lungs usually showed an interstitial and perivascular infiltration by myelocytes, sometimes mixed with polymorphonuclear leucocytes, sometimes with lymphoid cells.

The heart showed a slight focal infiltration, by lymphocytes in 3 birds, by myelocytes in 1, and by polymorphonuclears in 1. The remaining 4 hearts were normal.

The liver in 3 birds was normal. In 4 it showed a slight to moderate periportal myelocyte infiltration, mixed with leucocytes in one and with lymphoid cells in another. In 2 birds a slight to moderate periportal myelocyte or myelocyte and lymphocyte infiltration was accompanied by focal necroses in the parenchyma, composed of shrunken oxyphil coagulated karyolytic liver cells in the one and of cell debris and fragmenting leucocytes and red corpuscles in the other

The pancreas regularly showed a slight to moderate interstitial myelocyte infiltration, mixed in 2 of 6 birds with polymorphonuclears.

The kidneys and Wolffian bodies were usually normal, a few foci of interstitial myelocyte or myelocyte and leucocyte infiltration occurring in the metanephros and mesonephros in one bird each, respectively.

The spleen pulp and the bone marrow were usually packed with granular myelocytes. In 4 birds from the later passage generations there was a variable admixture ranging up to predominance of polymorphonuclear leucocytes.

Splenic ellipsoids were sometimes prominent, and in later passage generations a moderate to marked pulp reticulo-endotheliosis with erythrophagia and hemosiderosis was noted.

In one bird a focal myelocyte infiltration of the chorioid plexus was present. In another, focal hemorrhage and polymorphonuclear infiltration were noted in the cranial arachnoidal mesenchyme. Otherwise there were no lesions in the brain, cord, cranial, and spinal root ganglia, chorioid plexus, or meninges.

Generally the reaction is of minor grade and not particularly specific, bearing little resemblance to that seen in mice (*4*) or monkeys (*4*, *5*). There seems to be an increased tendency to maturation of myeloid collections toward polymorphonuclear leucocytes, and in the fetal membranes the latter is often the predominating reacting cell type.

REFERENCES

(1) Lillie, R. D.: Histologic reaction to the virus of Rocky Mountain spotted fever in chick embryos. Pub. Health Rep., **50**: 1498–1501 (1935).

(2) Bengtson, I. A., and Dyer, R. E.: Cultivation of the virus of Rocky Mountain spotted fever in the developing chick embryo. Pub. Health Rep., **50**: 1489–1498 (1935).

(3) Bengtson, I. A., and Wooley J. G.: Cultivation of the virus of lymphocytic choriomeningitis in the developing chick embryo. Pub. Health Rep., **51**: 29–41 (1936). (Preceding article in this issue.)

(4) Armstrong, C., and Lillie, R. D.: Experimental lymphocytic choriomeningitis of monkeys and mice produced by a virus encountered in studies of the 1933 St. Louis encephalitis epidemic. Pub. Health Rep., **49**, 1019–1027 (1934).

(5) Lillie, R. D.: The pathologic histology of lymphocytic choriomeningitis in monkeys. (In MS.)

REPORTING PARALYTIC AND NONPARALYTIC POLIOMYELITIS

Massachusetts Public Health Council Requires Differentiation Beginning January 1, 1936

By a recent vote of the Massachusetts Public Health Council it was determined that, effective January 1, 1936, all cases of anterior poliomyelitis in that State shall be reported as "paralytic" or "nonparalytic (preparalytic)" infections. This action was taken in order to obtain, so far as possible, a true picture of the current prevalence of the disease as contrasted with former years when the nonparalytic cases were not reported to the same extent as they are at the present time.

In the future all reports made by the Department of Public Health of Massachusetts will be in accordance with the classification above mentioned, and supplemental reports will be filed as cases reported as preparalytic subsequently develop paralytic signs, and the change in the classification therefore becomes necessary.

DEATHS DURING WEEK ENDED DEC. 21, 1935

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

	Week ended Dec. 21, 1935	Corresponding week, 1934
Data from 86 large cities of the United States:		
Total deaths	8,814	9,091
Deaths per 1,000 population, annual basis	12.3	12.7
Deaths under 1 year of age	550	585
Deaths under 1 year of age per 1,000 estimated live births	50	55
Deaths per 1,000 population, annual basis, first 51 weeks of year	11.4	11.3
Data from industrial insurance companies:		
Policies in force	67,826,231	67,079,418
Number of death claims	13,014	13,066
Death claims per 1,000 policies in force, annual rate	10.0	10.2
Death claims per 1,000 policies, first 51 weeks of year, annual rate	9.5	9.8

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended Dec. 28, 1935, and Dec. 29, 1934

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 28, 1935, and Dec. 29, 1934

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934
New England States:								
Maine	----	----	2	2	129	3	0	1
New Hampshire	----	----	----	----	25	24	0	0
Vermont	----	1	----	----	169	2	0	0
Massachusetts	15	17	----	----	122	112	3	1
Rhode Island	1	6	----	----	42	6	1	0
Connecticut	1	1	6	81	48	278	0	0
Middle Atlantic States:								
New York	39	38	[1] 19	[1] 76	444	378	8	2
New Jersey	16	33	8	360	27	48	3	2
Pennsylvania	31	42	----	----	150	815	4	1
East North Central States:								
Ohio	47	97	11	360	60	435	3	7
Indiana	36	39	45	50	1	211	6	1
Illinois	52	73	35	57	22	1,056	11	7
Michigan	11	16	----	8	16	101	2	2
Wisconsin	2	6	55	25	84	369	1	4
West North Central States:								
Minnesota	----	13	----	----	32	298	1	0
Iowa	12	7	----	2	2	917	3	0
Missouri	33	37	97	80	12	213	2	3
North Dakota	----	16	----	32	1	126	1	1
South Dakota	2	----	1	----	2	18	3	0
Nebraska	2	11	----	----	65	44	0	3
Kansas	15	9	1	3	7	327	1	2
South Atlantic States:								
Delaware	1	3	----	4	28	2	0	0
Maryland [2]	8	7	8	115	39	42	4	0
District of Columbia	17	5	----	3	----	4	4	1
Virginia	47	30	----	----	50	112	4	2
West Virginia	11	29	113	13	8	237	4	0
North Carolina [3]	22	17	12	164	2	503	1	1
South Carolina	3	5	162	1,086	----	8	1	0
Georgia [4]	18	20	86	581	----	9	2	2
Florida	6	10	2	1	2	7	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 28, 1935, and Dec. 29, 1934—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934
East South Central States:								
Kentucky	33	36	10	23	12	140	7	1
Tennessee	16	32	63	79	1	11	1	0
Alabama [4]	26	28	110	258	8	174	0	4
Mississippi [2]	7	8	----	----	----	----	1	1
West South Central States:								
Arkansas	9	15	36	16	----	18	1	0
Louisiana [4]	23	19	13	6	21	23	1	1
Oklahoma [5]	12	17	111	123	----	4	11	1
Texas [4]	110	67	324	208	15	32	13	1
Mountain States:								
Montana	4	10	7	5	5	68	0	0
Idaho	----	----	----	----	21	3	0	1
Wyoming	----	2	2	----	1	5	0	0
Colorado	6	12	----	----	9	309	0	1
New Mexico	3	3	3	1	3	31	0	1
Arizona	3	1	51	32	----	16	1	1
Utah [2]	1	----	----	4	4	16	0	0
Pacific States:								
Washington	----	1	----	1	174	69	2	1
Oregon	3	1	36	74	310	13	0	0
California	40	48	40	42	217	66	3	5
Total	744	888	1,469	3,975	2,390	7,703	115	62
52 weeks of year	38,034	40,516	118,416	67,590	721,872	728,654	5,591	2,295

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934
New England States:								
Maine	2	0	26	18	0	0	3	4
New Hampshire	0	0	12	19	0	0	0	1
Vermont	0	0	5	17	0	0	0	0
Massachusetts	3	0	236	145	0	0	2	2
Rhode Island	2	0	23	12	0	0	0	0
Connecticut	1	0	50	46	0	0	0	1
Middle Atlantic States:								
New York	2	1	485	450	0	0	12	7
New Jersey	6	1	137	104	0	0	4	4
Pennsylvania	5	1	302	361	0	0	12	7
East North Central States:								
Ohio	0	2	365	805	3	1	2	4
Indiana	0	0	168	202	5	0	0	7
Illinois	3	1	499	610	5	4	4	11
Michigan	0	0	201	276	3	1	1	0
Wisconsin	0	0	416	375	16	19	2	0
West North Central States:								
Minnesota	0	1	254	106	17	6	1	1
Iowa	2	0	141	64	2	0	0	4
Missouri	0	0	121	57	4	0	4	9
North Dakota	0	1	31	69	5	4	1	0
South Dakota	0	0	35	13	8	5	1	0
Nebraska	0	1	170	30	61	10	0	0
Kansas	0	0	116	67	17	2	0	2
South Atlantic States:								
Delaware	0	0	5	7	0	0	0	0
Maryland [2]	1	0	56	101	0	0	12	1
District of Columbia	0	1	14	28	0	0	3	1
Virginia	1	0	48	86	0	0	5	7
West Virginia	0	0	77	125	0	0	2	1
North Carolina [3]	1	0	53	42	0	0	6	11
South Carolina	0	0	9	8	0	1	0	5
Georgia [4]	0	0	27	16	0	0	3	7
Florida	0	2	9	16	0	1	1	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 28, 1935, and Dec. 29, 1934—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934	Week ended Dec. 28, 1935	Week ended Dec. 29, 1934
East South Central States:								
Kentucky	0	0	53	57	0	0	3	4
Tennessee	0	0	36	61	0	2	5	5
Alabama [4]	4	0	11	12	0	1	7	10
Mississippi [2]	0	1	11	17	0	0	3	4
West South Central States:								
Arkansas	1	1	8	12	0	5	8	10
Louisiana [4]	0	0	14	22	0	4	4	11
Oklahoma [5]	0	2	31	46	0	1	12	12
Texas [4]	2	1	117	50	1	5	9	19
Mountain States:								
Montana	0	0	243	10	14	0	0	0
Idaho	0	0	53	2	1	0	0	0
Wyoming	0	0	86	13	2	4	1	0
Colorado	0	0	143	179	2	1	0	0
New Mexico	0	0	50	17	0	0	4	2
Arizona	0	1	13	14	0	0	0	4
Utah [2]	0	0	83	53	0	0	0	0
Pacific States:								
Washington	0	0	66	27	23	29	1	2
Oregon	0	2	48	62	1	1	1	0
California	4	26	234	170	3	6	10	5
Total	40	46	5,391	5,099	193	113	149	187
52 weeks of year	10,733	7,276	251,583	214,614	7,490	5,142	17,491	21,032

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended Dec. 28, 1935, North Carolina, 1 case.
[4] Typhus fever, week ended Dec. 28, 1935, 27 cases, as follows: Georgia, 10; Alabama, 5; Louisiana, 4; Texas, 8.
[5] 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
October 1935										
Hawaii Territory	1	7	13	----	----	----	1	1	0	2
November 1935										
California	17	240	157	13	656	4	41	1,063	17	44
Louisiana	7	118	33	165	40	15	6	55	0	42
Montana	7	8	50	----	60	----	2	553	199	3
New Hampshire	----	1	----	----	----	----	2	42	0	----
Oklahoma [1]	11	99	288	186	5	12	3	110	5	50
Oregon	3	9	114	1	1,014	----	22	265	0	9
Virginia	8	301	261	17	116	5	8	301	0	40
Washington	9	15	27	----	400	----	5	332	145	8

[1] Exclusive of Oklahoma City and Tulsa.

October 1935

	Cases
Hawaii Territory:	
Chicken pox	28
Epidemic encephalitis	1
Leprosy	2
Mumps	37
Typhus fever	9
Whooping cough	40

November 1935

	Cases
Actinomycosis:	
California	1
Anthrax:	
California	1
Louisiana	1
Botulism:	
California	3
Chicken pox:	
California	1,372
Louisiana	9
Montana	173
Oklahoma [1]	31
Oregon	224
Virginia	284
Washington	470
Conjunctivitis:	
Montana	3
Dysentery:	
California (amoebic)	9
California (bacillary)	9
Louisiana (amoebic)	8
Louisiana (bacillary)	7
Oklahoma [1]	15
Virginia (amoebic)	2
Virginia (unspecified, diarrhea included)	72
Washington (bacillary)	1
Epidemic encephalitis:	
California	5
Montana	2
Oregon	3
Virginia	1
Washington	1
Food poisoning:	
California	8

November 1935—Continued

	Cases
German measles:	
California	287
Montana	4
Washington	87
Granuloma, coccidioidal:	
California	1
Hookworm disease:	
California	1
Louisiana	14
Impetigo contagiosa:	
Montana	47
Oklahoma [1]	9
Oregon	132
Washington	3
Jaundice, epidemic:	
California	1
Mumps:	
California	902
Louisiana	7
Montana	605
Oklahoma [1]	45
Oregon	109
Virginia	94
Washington	406
Ophthalmia neonatorum:	
California	1
Oklahoma [1]	1
Paratyphoid fever:	
California	3
Louisiana	1
Oregon	3
Virginia	2
Washington	1
Psittacosis:	
California	3
Rabies in animals:	
California	29
Louisiana	7
Oregon	2
Washington	2
Rabies in man:	
Virginia	1
Rocky Mountain spotted fever:	
Virginia	1

November 1935—Continued

	Cases
Scabies:	
Montana	1
Oklahoma [1]	1
Oregon	47
Septic sore throat:	
California	9
Louisiana	1
Montana	15
Oklahoma [1]	73
Oregon	9
Virginia	12
Washington	10
Tetanus:	
California	5
Louisiana	7
Oklahoma [1]	1
Virginia	2
Trachoma:	
California	18
Lousiana	1
Oklahoma [1]	6
Virginia	1
Washington	30
Trichinosis: California	6
Tularemia:	
California	1
Montana	2
Virginia	15
Typhus fever:	
California	2
Virginia	1
Undulant fever:	
California	2
Louisiana	7
Virginia	3
Vincent's infection:	
Oklahoma [1]	1
Oregon	13
Virginia	1
Whooping cough:	
California	521
Louisiana	39
Montana	25
Oklahoma [1]	9
Virginia	112
Washington	72

WEEKLY REPORTS FROM CITIES

City reports for week ended Dec. 21, 1935

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								
Maine:											
Portland	0	1	0	1	2	1	0	-------	0	12	21
New Hampshire:											
Concord	0	-------	0	0	0	1	0	1	0	0	11
Manchester	0	-------	0	0	0	5	0	0	0	0	21
Nashua	0	-------	-------	0	-------	0	0	-------	0	0	-------
Vermont:											
Barre	0	-------	0	0	0	0	0	0	0	0	2
Burlington	0	-------	0	0	-------	0	0	-------	0	0	9
Rutland	0	-------	0	0	2	1	0	1	0	0	7
Massachusetts:											
Boston	2	-------	2	35	29	63	0	11	0	11	243
Fall River	1	-------	0	0	3	1	0	1	0	0	31
Springfield	0	-------	0	3	3	8	0	0	0	21	36
Worcester	0	-------	0	0	2	28	0	1	0	6	41
Rhode Island:											
Pawtucket	0	-------	0	0	0	0	0	0	0	0	16
Providence	0	-------	0	10	8	15	0	2	0	11	84
Connecticut:											
Bridgeport	1	5	2	0	2	1	0	0	0	3	37
Hartford	2	-------	0	0	4	2	0	0	0	12	37
New Haven	0	1	1	0	2	1	0	0	0	13	54

[1] Exclusive of Oklahoma City and Tulsa.

City reports for week ended Dec. 21, 1935—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid-fever cases	Whooping-cough cases	Deaths, all causes
		Cases	Deaths								
New York:											
Buffalo	0	----	0	19	27	59	0	6	0	4	155
New York	40	13	8	128	166	167	0	86	1	101	1,516
Rochester	0	----	0	1	4	1	0	1	0	1	80
Syracuse	0	----	0	2	3	2	0	1	0	14	45
New Jersey:											
Camden	0	----	0	1	5	1	0	0	0	0	31
Newark	0	5	1	2	9	46	0	6	0	29	111
Trenton	0	----	0	0	3	9	0	4	0	2	45
Pennsylvania:											
Philadelphia	5	5	3	86	42	92	0	19	2	77	534
Pittsburgh	4	2	4	22	28	63	0	6	0	27	187
Reading	0	----	0	1	3	0	0	2	0	0	23
Scranton	1	----	----	4	----	2	0	----	0	0	----
Ohio:											
Cincinnati	9	----	3	1	13	20	0	3	0	0	160
Cleveland	7	40	3	7	21	28	0	12	0	47	186
Columbus	7	3	3	1	9	7	0	2	0	6	90
Toledo	0	4	1	25	8	18	0	2	0	7	82
Indiana:											
Anderson	0	----	0	1	2	1	0	1	0	5	8
Fort Wayne	5	----	0	0	3	10	2	1	0	0	35
Indianapolis	1	----	1	2	23	35	0	4	0	16	133
South Bend	0	----	0	0	1	2	0	0	0	0	13
Terre Haute	0	----	0	0	0	0	0	0	0	0	25
Illinois:											
Alton	4	----	0	0	4	2	1	0	1	0	13
Chicago	16	11	1	10	58	197	0	35	1	113	757
Elgin	1	----	0	0	1	0	0	0	0	0	10
Moline	0	----	0	0	0	8	0	0	0	1	2
Springfield	0	----	0	0	2	4	0	0	0	2	15
Michigan:											
Detroit	4	----	4	4	37	81	0	21	0	112	280
Flint	3	----	0	2	4	17	0	0	0	2	23
Grand Rapids	0	----	0	1	3	20	0	0	0	6	38
Wisconsin:											
Kenosha	0	----	0	0	0	7	0	1	0	1	9
Milwaukee	0	2	2	3	10	62	0	2	1	91	109
Racine	0	----	0	2	2	7	0	0	0	5	23
Superior	0	----	1	1	0	5	0	0	0	0	9
Minnesota:											
Duluth	0	----	0	0	3	1	0	0	0	10	17
Minneapolis	1	----	1	10	15	108	0	1	0	12	122
St. Paul	0	----	0	14	9	44	0	1	0	3	74
Iowa:											
Cedar Rapids	0	----	----	0	----	2	0	----	0	2	----
Davenport	0	----	----	0	----	9	0	----	0	0	----
Des Moines	4	----	----	0	5	5	2	1	0	0	50
Sioux City	0	----	----	0	----	2	0	----	0	0	----
Waterloo	4	----	----	0	----	6	0	----	0	2	----
Missouri:											
Kansas City	5	1	0	1	12	12	0	6	0	1	87
St. Joseph	3	----	0	0	0	3	0	0	0	1	----
St. Louis	19	----	2	0	19	48	0	7	3	0	210
North Dakota:											
Fargo	0	----	0	3	0	16	0	0	0	0	6
Grand Forks	0	----	----	0	----	0	0	----	0	0	----
Minot	0	----	----	0	----	6	0	----	0	0	7
South Dakota:											
Aberdeen	0	----	----	0	----	1	0	----	0	0	----
Nebraska:											
Omaha	5	----	1	2	5	164	6	2	0	0	53
Kansas:											
Lawrence	0	----	0	0	0	0	0	0	0	0	3
Topeka	0	----	0	0	3	7	0	0	0	1	26
Wichita	1	----	0	1	3	9	0	1	0	0	21
Delaware:											
Wilmington	0	----	0	0	5	2	0	2	0	2	28
Maryland:											
Baltimore	6	4	2	2	17	34	0	9	6	17	201
Cumberland	1	1	1	0	1	4	0	0	0	0	17
Frederick	0	----	0	0	0	0	0	0	0	0	2
District of Columbia:											
Washington	24	1	1	1	22	10	0	12	0	1	187

City reports for week ended Dec. 21, 1935—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								
Virginia:											
Lynchburg	2	----	2	0	2	4	0	2	0	8	14
Norfolk	0	----	0	0	6	5	0	3	0	0	39
Richmond	0	----	1	0	5	4	0	3	1	1	50
Roanoke	0	----	0	0	1	0	0	0	0	0	19
West Virginia:											
Charleston	0	1	1	0	0	4	0	0	0	0	8
Wheeling	0	----	0	5	6	4	0	1	0	0	22
North Carolina:											
Gastonia	1	----	0	0	1	1	0	0	0	0	1
Raleigh	----	----	----	----	----	----	----	----	----	----	----
Wilmington	2	----	0	0	2	1	0	0	0	1	18
Winston-Salem	3	3	2	0	0	3	0	0	0	0	9
South Carolina:											
Charleston	1	20	2	0	3	2	0	1	0	2	24
Columbia	----	----	----	----	----	----	----	----	----	----	----
Florence	0	----	0	0	1	0	0	0	0	0	6
Greenville	0	----	0	1	1	0	0	0	0	0	5
Georgia:											
Atlanta	1	33	2	1	12	16	0	2	0	0	82
Brunswick	0	----	0	0	2	0	0	0	0	0	6
Savannah	3	13	1	0	7	1	0	1	1	0	50
Florida:											
Miami	5	2	1	0	2	0	0	4	0	0	45
Tampa	1	1	1	0	2	2	0	2	0	0	23
Kentucky:											
Ashland	0	----	----	0	----	1	0	----	0	0	----
Covington	1	1	0	0	0	5	0	0	0	0	17
Louisville	2	----	0	1	11	8	0	0	0	0	67
Tennessee:											
Knoxville	4	3	0	0	1	1	0	3	1	0	17
Memphis	4	----	1	0	9	6	0	3	0	2	80
Nashville	2	----	4	0	13	5	0	1	0	0	66
Alabama:											
Birmingham	3	8	3	1	10	2	0	3	0	0	61
Mobile	0	2	2	0	2	0	0	2	0	0	25
Montgomery	1	4	----	0	----	2	0	----	0	5	----
Arkansas:											
Fort Smith	0	----	----	0	----	1	0	----	0	0	----
Little Rock	1	----	0	1	13	2	0	2	0	0	17
Louisiana:											
New Orleans	0	----	8	6	14	2	0	10	1	7	185
Shreveport	0	----	0	0	5	2	0	3	1	0	32
Oklahoma:											
Oklahoma City	2	4	0	2	5	6	0	1	0	0	39
Texas:											
Dallas	9	3	3	0	6	8	0	4	0	0	75
Fort Worth	8	----	1	0	2	5	0	3	0	1	44
Galveston	7	----	0	0	4	2	0	0	0	0	17
Houston	7	----	1	2	12	2	0	2	0	0	96
San Antonio	1	----	3	0	8	2	0	0	0	0	57
Montana:											
Billings	0	----	1	0	0	9	0	0	0	0	9
Great Falls	0	----	0	0	0	4	0	1	0	5	11
Helena	0	----	0	0	0	1	0	0	0	0	2
Missoula	0	----	0	0	3	34	1	0	0	0	13
Idaho:											
Boise	0	----	0	0	0	4	0	1	0	0	4
Colorado:											
Colorado Springs	0	----	0	1	2	12	0	0	0	2	12
Denver	3	----	0	4	5	17	0	2	1	3	80
Pueblo	1	----	0	0	2	13	0	0	0	0	10
New Mexico:											
Albuquerque	----	----	1	1	1	14	0	2	0	0	12
Utah:											
Salt Lake City	0	----	0	0	3	45	0	1	0	5	35
Nevada:											
Reno	----	----	----	----	----	----	----	----	----	----	----
Washington:											
Seattle	0	----	0	10	----	18	0	----	0	2	----
Spokane	0	----	0	8	5	1	1	1	0	3	30
Tacoma	0	----	0	0	2	0	0	1	0	1	32
Oregon:											
Portland	0	3	0	59	4	19	0	1	0	3	66
Salem	0	----	----	0	----	2	0	----	0	0	----
California:											
Los Angeles	8	20	0	40	23	46	0	19	2	18	303
Sacramento	1	----	0	2	4	31	0	1	0	3	34
San Francisco	1	----	1	55	5	30	0	12	0	32	171

City reports for week ended Dec. 21, 1935—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	1	0
Worcester	2	1	1
Rhode Island:			
Providence	1	0	0
Connecticut:			
Bridgeport	1	0	0
New York:			
New York	9	5	3
Pennsylvania:			
Philadelphia	2	1	0
Pittsburgh	1	0	0
Scranton	1	0	0
Ohio:			
Cincinnati	1	0	0
Cleveland	2	0	0
Indiana:			
Indianapolis	1	1	0
Illinois:			
Chicago	0	1	0
Springfield	1	1	0
Michigan:			
Detroit	0	0	1
Wisconsin:			
Milwaukee	1	1	0
Minnesota:			
Minneapolis	1	0	0
Missouri:			
St. Joseph	2	0	0
St. Louis	2	1	0
Kansas:			
Wichita	0	0	1
Maryland:			
Baltimore	3	0	0
District of Columbia:			
Washington	1	1	0
West Virginia:			
Wheeling	1	0	0
North Carolina:			
Wilmington	1	0	0
South Carolina:			
Charleston	1	0	0
Kentucky:			
Louisville	2	2	0
Tennessee:			
Knoxville	1	0	0
Alabama:			
Birmingham	1	0	0
Arkansas:			
Little Rock	2	1	0
Texas:			
Fort Worth	1	0	0
Colorado:			
Colorado Springs	1	0	0
Washington:			
Seattle	1		0
Spokane	2	1	0
Oregon:			
Portland	1	0	0
California:			
Los Angeles	1	1	1
Sacramento	1	1	0

Dengue.—Cases: Miami, 1.

Epidemic encephalitis.—Cases: Newark, 1; Trenton, 2; Toledo, 1; St. Louis, 1; New Orleans, 1.

Pellagra.—Cases: Boston, 1; Wilmington, N. C., 1; Winston-Salem, 1; Atlanta, 1; Savannah, 1; Montgomery, 1.

Typhus fever.—Cases: Atlanta, 2; New Orleans, 1; Dallas, 1; Fort Worth, 2.

FOREIGN AND INSULAR

BELGIUM

Vital statistics—1934.—Following are vital statistics for Belgium for the year 1934:

	Number	Rate per 1,000 inhabitants
Population	8,275,552	
Marriages	62,692	7.58
Live births	132,568	16.02
Deaths	100,731	12.17

CANADA

Provinces—Communicable diseases—2 weeks ended December 14, 1935.—During the 2 weeks ended December 14, 1935, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				1	2	1			1	5
Chicken pox		74	15	481	1,050	225	63	40	258	2,206
Diphtheria		3	15	76	28	6	8	1	1	138
Erysipelas				12	6	4	2	4	4	32
Influenza		13	1		28				4	46
Lethargic encephalitis						1				1
Measles		62	231	547	1,677	53	440	84	458	3,552
Mumps		60			842	266	903	12	204	2,287
Paratyphoid fever					1					1
Pneumonia	2				16		3		7	28
Poliomyelitis				1				1		2
Scarlet fever		13	5	294	632	102	41	59	56	1,202
Smallpox									2	2
Trachoma									11	11
Tuberculosis	1	10	11	82	90	14	11	2	13	234
Typhoid fever			3	79	7	3			1	93
Undulant fever				1	6					7
Whooping cough		77	3	267	421	55	62	5	6	896

CZECHOSLOVAKIA

Communicable diseases—October 1935.—During the month of October 1935, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	7		Paratyphoid fever	19	
Cerebrospinal meningitis	11	5	Poliomyelitis	45	2
Chicken pox	276		Puerperal fever	64	31
Diphtheria	2,933	146	Scarlet fever	3,847	40
Dysentery	355	38	Trachoma	130	
Influenza	53	1	Typhoid fever	597	48
Lethargic encephalitis	2	2	Typhus fever	13	2
Malaria	33				

YUGOSLAVIA

Communicable diseases—November 1935.—During the month of November 1935, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	57	7	Poliomyelitis	3	----
Cerebrospinal meningitis	3	----	Scarlet fever	1,028	13
Diphtheria and croup	1,183	110	Sepsis	9	7
Dysentery	512	60	Tetanus	43	23
Erysipelas	370	20	Typhoid fever	766	71
Measles	713	2	Typhus fever	10	2
Paratyphoid fever	45	----			

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 December 27, 1935, pages 1834–1848. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued January 31, 1936, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

Cholera

India—Negapatam.—During the week ended December 21, 1935, 4 cases of cholera were reported at Negapatam, India.

Siam—Lopburi Province.—During the week ended December 21, 1935, 9 cases of cholera were reported in Lobpuri Province, Siam.

Plague

Egypt—Minya.—During the week ended December 21, 1935, 1 death from plague was reported at Minya, Egypt.

Hawaii Territory—Hawaii Island—Hamakua District—Hamakua Mill Sector.—On December 23, 1935, 1 plague-infected rat was reported in Hamakua Mill Sector, Hamakua District, Hawaii Island, Hawaii Territory.

Typhus Fever

Iraq.—During the week ended December 14, 1935, 17 cases of typhus fever with 6 deaths were reported in Iraq.

Yellow Fever

Ivory Coast—Abidjan.—During the week ended December 21, 1935, 1 case of yellow fever was reported at Abidjan, Ivory Coast.

Senegal—Dakar.—Information dated December 17, 1935, states that 1 suspected case of yellow fever with 1 death was reported at Dakar, Senegal, being imported from M'Backe, Baol Circle, Senegal.

×