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Isolation and Characterization of Rocky Mountain Spotted Fever Rickettsiae From the Rabbit Tick *Haemaphysalis leporis-palustris* Packard

By R. R. PARKER, Ph.D., E. G. PICKENS, D. B. LACKMAN, Ph.D., E. J. BELL, D.Sc.
and F. B. THRAKILL*

Parker (1) in 1923 and Jellison (2) in 1945 noted the probable significance of the rabbit tick, *Haemaphysalis leporis-palustris*, and Nuttall's cottontail rabbit, *Sylvilagus nuttallii*, respectively, in maintaining Rocky Mountain spotted fever in nature in the western United States. In the earlier work no strains of rickettsiae were actually isolated and characterized. The present report deals with the serological and immunological characteristics of strains of rickettsiae isolated from this tick in 1948 and 1949, and particularly their comparison with laboratory strains of spotted fever rickettsiae.

Three hundred and ten *H. leporis-palustris* were obtained from six cottontail rabbits shot July 27, 1948, in Coyote Gulch in the Bitter Root Valley. These ticks were divided into five groups for testing. Each group of 62 ticks was ground in a mortar and suspended in 10 ml. of physiological saline. Each suspension was divided into two portions. One part was used for the intraperitoneal injection of guinea pigs and the other part for inoculation into yolk sacs of developing chick embryos.

An outbreak of salmonellosis then occurred in our guinea pig colony and no isolations of rickettsiae were made from them. However, two of the groups of ticks injected into eggs yielded strains of rickettsiae. During June, July, and August 1949, additional collections of *H. leporis-palustris* were made from 22 cottontails caught in the Bitter Root Valley of western Montana. Using these ticks, three strains of rickettsiae were recovered from guinea pigs inoculated with three lots of ticks and five strains of rickettsiae were recovered from five lots of ticks by direct inoculation into eggs. Three of these latter lots were the same as the three lots from which the guinea pig isolations were made. All strains had similar characteristics in guinea

*From the Rocky Mountain Laboratory (Hamilton, Mont.), Microbiological Institute, National Institutes of Health, Public Health Service. Dr. Parker died Sept. 4, 1949.

pigs, and this paper is mainly concerned with two strains which were picked on this basis as typical of *H. leporis-palustris* strains of rickettsiae.

Experimental

Penicillin sufficient to make a final concentration of 1,000 units per ml. was added to suspensions before inoculation of eggs to cut down death of embryos due to bacterial contamination. Eggs which had been incubated for 6 days were used, and 0.5 ml. of the tick suspension was inoculated into the yolk sac of each egg.

The record of the isolation of the two strains of rickettsiae used for our experiments follows. The first isolation was made from the yolk sacs of three embryos which died on the fourth day following inoculation. Smears of the yolk sacs, stained by the Macchiavello technique, contained rickettsiae. The yolk sacs were suspended in physiological saline and were used for a second yolk-sac passage. However, on this passage a strain of *Neisseria catarrhalis* was present as a contaminant, although rickettsiae could also be seen in the smears of the yolk sacs. The contaminant was eliminated by suspending the yolk sacs for the next two passages in physiological saline containing 2,000 units of penicillin and 500 Sherman units of streptomycin per ml. Subsequent passages were free of the contaminant, and this strain of rickettsia was established in guinea pigs from the yolk-sac material. It is referred to hereafter as the group 2 strain.

The other rickettsial strain was isolated in a similar manner. An actinomycete appeared as a contaminant but was eliminated by suspending the yolk sacs used as inoculum for the third and fourth egg passages in saline containing 2,000 units of penicillin and 500 units of streptomycin per ml. The strain was then established in guinea pigs from the yolk-sac material. It will be referred to as the group 3 strain.

Upon establishment of these strains of rickettsiae in guinea pigs, marked differences were noted when the clinical picture was compared with that of a stock laboratory strain of Rocky Mountain spotted fever rickettsia. In table 1 are presented the comparative observations made on 20 guinea pigs injected intraperitoneally with 1 ml. of blood from passage guinea pigs infected with the rabbit-tick (*H. leporis-palustris*) strain of rickettsia and 20 guinea pigs infected in a similar manner with a laboratory strain of Rocky Mountain spotted fever rickettsiae originally isolated from *Dermacentor andersoni* ticks and maintained in the laboratory for several years by guinea pig passage.

In each instance a difference will be noted. For the laboratory spotted fever strain the incubation period is only half as long; the febrile period is twice as long; almost twice as many guinea pigs show

Table 1. *Comparative observations on 20 guinea pigs infected with an H. leporis-palustris strain of rickettsiae and 20 guinea pigs infected with a laboratory strain of spotted fever rickettsiae*

	Spotted fever strain	<i>H. leporis-palustris</i> strain
Average length in days of:		
Incubation period.....	3.0	5.5
Febrile period.....	8.5	4.0
Scrotal involvement.....	8.0	2.5
Percentage of guinea pigs showing scrotal involvement.....	93.0	56.0
Average rectal temperature during febrile period.....	40.6° C.	40.0° C.
Percentage of guinea pigs dying as a result of the infection.....	90.0	0

scrotal involvement, and the average rectal temperature during the febrile period is six-tenths of a degree higher than for the *H. leporis-palustris* strain of rickettsia. Ninety percent of the guinea pigs injected with the spotted fever strain succumbed as a result of the infection, whereas there were no fatalities with the *H. leporis-palustris* strain. An additional point not noted in the table is the difference in the type of scrotal involvement observed. With the spotted fever strain, marked swelling progressing to a dark-purplish congestion followed by necrosis and sloughing is observed. With the *H. leporis-palustris* strain, the scrotal reaction usually consists of swelling and redness only.

The *H. leporis-palustris* strains of rickettsiae have shown no increase in virulence on prolonged passage in guinea pigs. In fact, there is a tendency for them to decrease in virulence, making it difficult to maintain a guinea-pig-passage strain.

When guinea pigs which have been infected with the less virulent *H. leporis-palustris* strains are challenged with a laboratory strain of spotted fever rickettsiae, they are found to be immune. Parker (1) in 1923 showed that guinea pigs could have infection of such mildness with *H. leporis-palustris* strains as to be classed as "inapparent infection," yet, when subsequently challenged with a virulent strain of Rocky Mountain spotted fever rickettsia, there was complete immunity. The same results have been observed in this laboratory on several occasions since that time. The results of the most recent immunity test carried out with an *H. leporis-palustris* strain are given in table 2.

Initial injection with either the *H. leporis-palustris* strain or the laboratory strain of rickettsiae produced complete immunity against boutonneuse fever, South African tick-bite fever, and maculatum disease as well as against each other. Likewise, inoculation with these rickettsiae protected against challenge with either the *H. leporis-palustris* strain or the laboratory spotted fever strain of rickettsiae. The rickettsiae of boutonneuse fever, South African tick-bite

Table 2. *Cross-immunity tests in guinea pigs employing the H. leporis-palustris strain of rickettsia in comparison with a laboratory spotted fever strain of rickettsia*

Rickettsiae used for the original infection	Rickettsiae used for the challenge inoculation									
	<i>H. l.-p.</i>	RMsf	Mac.	B. F.	SAtb	NQtt	RP	Epid. typh.	Murine typhus	Q fever
<i>H. l.-p.</i>		0/6	0/6	0/6	0/6	6/6	5/5	3/6	6/6	6/6
RMsf	0/6		0/6	0/6	0/6	4/6	6/6	2/6	6/6	6/6
Mac.	0/6	0/6	<i>H. l.-p.</i> = The group 3 strain was used. RMsf = Rocky Mountain spotted fever, isolation from a human case. Mac. = Maculatum disease. B. F. = Boutonneuse fever. SAtb = South African tick-bite fever. NQtt = North Queensland tick typhus. RP = Rickettsialpox. Q fever = American, 9-Mile strain used. Infectivity controls were employed for all material used in challenging and in making the original injection. In each instance the challenge material proved to be infectious for all the control guinea pigs.							
B. F.	0/6	0/6								
SAtb	0/6	0/6								
NQtt	6/6	6/6								
RP	0/5	6/6								
Epidemic typhus	4/6	5/5								
Murine typhus	0/4	6/6								
Q fever	6/6	6/6								

Numerator=Number of guinea pigs showing infection.
 Denominator=Number of guinea pigs challenged.

fever, and maculatum disease are most closely related antigenically to spotted fever.

Partial immunity between the spotted fever strain or the *H. leporis-palustris* strain of rickettsiae and epidemic typhus rickettsiae was noted. This is not an unusual finding. It will be noted that neither strain of rickettsiae produced much immunity against rickettsialpox and North Queensland tick-typhus. On the whole, both the *H. leporis-palustris* strain of rickettsia and laboratory strain of spotted fever rickettsia showed essentially the same spectrum of immunity.

Davis and Parker (3) reported failure of Rocky Mountain spotted fever vaccine to protect guinea pigs against challenge with boutonneuse fever, although Badger (4) had demonstrated the existence of complete cross immunity between the living rickettsiae.

The possibility of a similar relationship existing between the *H. leporis-palustris* strains of rickettsiae and spotted fever rickettsiae led us to examine the cross immunity obtained with vaccines prepared from these two strains.

Vaccines were prepared according to the usual ether-extraction procedure for manufacturing rickettsial vaccines (5). These vaccines were injected into guinea pigs to test their capacity to induce active immunity against a virulent laboratory strain of spotted fever rickettsia and an *H. leporis-palustris* strain of rickettsia. Data on the vaccines employed are given in table 3.

In the first test the immunizing dose of vaccine was injected subcutaneously, followed in 10 days by a challenge dose of spotted fever rickettsiae injected intraperitoneally. In this experiment the challenge material consisted of 1 ml. of a 1:100 dilution of a 10-percent

Table 3. *Quantitative data on vaccines employed in comparative immunity studies*

Vaccine	Total nitrogen mgm/ml	Complement-fixing unit	CF units per mgm. total nitrogen
<i>H. leporis-palustris</i> vaccines:			
No. 1, group 2 strain	0.458	1:8	87.0
No. 2, group 2 strain	.564	1:2	18.0
No. 1, group 3 strain	.615	1:8	78.0
No. 2, group 3 strain	.228	undiluted	22.0
No. 278, group 2 strain	.482	1:2	20.8
Rocky Mountain spotted fever laboratory strain vaccines:			
S-179	.455	1:2	22.0
S-180	.460	1:2	22.0
S-181	.470	undiluted	11.0
S-182	.421	1:2	24.0
No. 278R	.366	1:4	54.6

suspension of yolk sacs infected with the laboratory strain of spotted fever rickettsiae which had been kept frozen in the dry-ice chest. This amount of material constituted 100 minimal infectious doses when injected intraperitoneally into guinea pigs of the size (500 gm.) used in this experiment.

Doses of vaccine varied from 1 to 10 complement-fixing units. Almost complete protection was obtained with the laboratory strain vaccines in all doses, whereas there was some evidence that the *H. leporis-palustris* strain vaccines afforded less protection. A quantitative study employing No. 278, group 2 vaccine, and No. 278R vaccine was then set up, and both strains were used for challenge. The results of this experiment are given in table 4.

Table 4. *Comparison of the immunogenic potency of vaccines prepared from an H. leporis-palustris strain of rickettsia and a stock laboratory (R) strain of spotted fever rickettsia*

Dosage of vaccine in CF units ¹ 1.0 ml. vol.	<i>H. leporis-palustris</i> vaccinated guinea pigs		R strain vaccinated guinea pigs	
	Challenge strain ²		Challenge strain	
	<i>H. l.-p.</i>	R	<i>H. l.-p.</i>	R
10.0	0/5	0/6	0/6	0/6
7.5	0/5	0/6	0/6	0/4
5.0	0/5	0/5	0/5	0/6
2.5	0/3	2/4	0/6	0/5
1.0	0/5	0/6	0/6	0/6
0.75	0/5	2/6	0/4	0/6
0.5	0/6	0/5	0/6	0/5
0.4	2/6	1/6	1/6	0/5
0.25	0/5	0/4	0/6	0/4
0.20	0/6	3/5	2/5	1/6
0.1	0/5	4/5	0/5	0/4
0.05	3/6	5/6	5/6	3/6
0.025	5/6	4/6	6/6	4/6
0.0125	6/6	6/6	6/6	2/6
0.00625	6/6	6/6	5/5	6/6

¹ Guinea pigs given two subcutaneous injections of vaccine one week apart.

² The guinea pigs were challenged by the intraperitoneal injection of about 100 minimum infectious doses of a standardized yolk-sac suspension of rickettsiae 10 days following the final immunizing dose of vaccine. Six control guinea pigs inoculated with each challenge material developed infection although there were no deaths. Numerator=number of guinea pigs showing infection. Denominator=number of guinea pigs challenged.

The results in table 4 indicate that qualitatively these two vaccines are identical. The *H. leporis-palustris* vaccine did not protect against challenge with the R strain of spotted fever in the lower doses quite as efficiently as did the homologous vaccine.

The usual spotted fever vaccine does not give rise to complement-fixing antibodies in guinea pigs. This was likewise true with these vaccines.

In order to further determine whether fundamental differences in antigenic structure existed between *H. leporis-palustris* strains of rickettsiae and laboratory strains of spotted fever rickettsiae, sera from convalescent guinea pigs were titrated by complement fixation against suspensions of both rickettsiae. Some results of these titrations are shown in table 5.

Table 5. Complement-fixing titer of convalescent guinea pig sera against rickettsial suspensions

Guinea pig injections and serum No.	Dilution of serum giving complete fixation with 2 units of:	
	Spotted fever rickettsial suspension	<i>H. l.-p.</i> strain rickettsial suspension
Group 3, <i>H. leporis-palustris</i> strain:		
2350.....	1:64	1:64
2355.....	1:64	1:128
2351.....	1:32	1:64
2359.....	1:256	1:256
2405.....	1:256	1:256
2473.....	1:64	1:64
Group 2, <i>H. leporis-palustris</i> strain: 2356.....	1:64	1:128
Suspension of ticks (<i>H. leporis-palustris</i>):		
C21873.....	1:64	1:48
C21874.....	1:64	1:32
Pooled spotted fever guinea pig serum (286) R strain.....	1:256	1:128
Pooled spotted fever guinea pig serum (283-3) R strain.....	1:64	1:128

NOTE: A Q fever rickettsial suspension was also used with these sera as a specificity control; no fixation was obtained.

The complement fixation tests are carried out at 5° C. for 18 hours.

Examination of the results in table 5 reveals that there are no consistent differences in titers whether the sera were titrated with a rickettsial suspension made with a laboratory spotted fever strain of rickettsia or an *H. leporis-palustris* strain.

Complement-fixing antigens, both soluble and rickettsial suspensions, were prepared and standardized against pooled, spotted fever convalescent guinea pig sera. No significant difference was noted between antigens prepared with the *H. leporis-palustris* strains of rickettsiae and our routine spotted fever complement-fixing antigens. Quantitative data on two lots of such antigens are given in table 6.

Discussion

Jellison (2) in 1945 reported that spotted fever rickettsiae had never been recovered from any mammal in nature in the highly endemic

Table 6. *Quantitative data on complement-fixing antigens prepared with the group 3, H. leporis-palustris strain of rickettsia*

	<i>H. l.-p.</i> preparation No. 232		<i>H. l.-p.</i> preparation No. 234	
	Rickettsial suspension	Soluble antigen	Rickettsial suspension	Soluble antigen
Total nitrogen (mg. per ml.).....	0.083	0.174	0.045	0.140
Complement-fixing unit ¹	1:16	1:16	1:8	1:12
C F units per mg. N.....	964.	457.	888.	430.
C F units per gm. of yolk-sac tissue (wet wt.).....	26.4	85.5	19.8	66.1

¹ Determined with convalescent guinea pig sera from animals infected with a laboratory strain of spotted fever rickettsiae and from animals infected with an *H. leporis-palustris* strain of rickettsiae.

area of the western United States. He cites one instance of a probable isolation from a pocket gopher in Oklahoma which was never confirmed. Harrell (6) in 1949 makes a similar statement. The immense amount of work involved in the collection and inoculation of tissues of various mammals and the small chance of obtaining any information of value has kept such studies at a minimum. Instead, serological surveys of mammals collected in nature have been performed to determine the incidence of rickettsial complement-fixing antibodies.

The most recent survey conducted by this laboratory was during 1946 and 1947 in the same general area from which the materials used in this report were collected. Sera from 286 mammals were examined for complement-fixing antibodies against the rickettsiae of murine typhus fever, Q fever, and Rocky Mountain spotted fever. These sera had the following distribution: 61 cottontail rabbits (*Sylvilagus nuttallii*), 10 jackrabbits (*Lepus* spp.), 1 snowshoe rabbit (*Lepus americanus*), 46 sidestripes (*Citellus lateralis*), 81 Columbian ground squirrels (*Citellus columbianus*), 6 skunks (*Mephitis mephitis*), 8 woodchucks (*Marmota flaviventer*), 32 pine squirrels (*Tamiasciurus hudsonicus*), 3 badgers (*Taxidea taxus*), 1 weasel (*Mustela* sp.), 2 conies (*Ochotona princeps*), 2 mountain goats (*Oreamnos americanus*), 5 porcupines (*Erethizon epixanthum*), 9 beavers (*Castor canadensis*), 16 muskrats (*Ondatra zibethica*), 1 moose (*Alces americanus*), 1 bobcat (*Lynx ratus*), and 1 mountain lion (*Felis concolor*). In this group of animals, six cottontail rabbits gave a positive reaction by complement fixation for spotted fever, and one porcupine was positive for Q fever. *Dermacentor andersoni* ticks picked from one of the goats yielded a strain of Q fever and a strain of spotted fever. A strain of spotted fever rickettsiae was recovered from *D. andersoni* larvae found on one of the sidestripes.

During the 1948-1949 studies described in this report, only one of the cottontail rabbits serving as hosts to the *H. leporis-palustris* ticks from which the isolations described were made was shown to have

specific complement-fixing antibodies for spotted fever. Coincident with the studies on ticks from cottontail rabbits, 10 snowshoe rabbits were trapped and brought to the laboratory. Sera from eight of these rabbits were positive for spotted fever by complement fixation, and the *H. leporis-palustris* ticks picked from three of these snowshoe rabbits showing a positive serological reaction were shown to contain spotted fever rickettsiae. Ticks collected from the other five rabbits showing positive serology were negative for spotted fever. This indicates that rabbits other than cottontail rabbits may be of importance in this problem.

Fitzpatrick (7) in 1946 suggested the use of the yolk sac of the developing chick embryo for isolating Rocky Mountain spotted fever rickettsiae from blood, because her results showed the chick embryo to be more susceptible than the guinea pig to this rickettsia. Because of intercurrent infection in our guinea pigs, we were unable to make a direct comparison between the developing chick embryo and guinea pigs for isolating rickettsiae from ticks. However, by using antibiotics to eliminate contaminating bacteria, the yolk sac of the developing chick embryo proved to be a very suitable medium for the direct isolation of strains of spotted fever rickettsiae from *H. leporis-palustris*.

Strains of spotted fever rickettsiae of low virulence which behave in a manner similar to *H. leporis-palustris* strains of rickettsiae in guinea pigs have been isolated from *D. andersoni*. However, a certain number of the strains isolated from this latter tick do show the severe type of reaction in guinea pigs; this has never been observed with strains from *H. leporis-palustris*. It could be postulated that the strains of low virulence sometimes present in *D. andersoni* were in reality *H. leporis-palustris* strains acquired by feeding on rabbits harboring infected rabbit ticks.

Summary

The isolation is reported of seven strains of Rocky Mountain spotted fever rickettsiae from *Haemaphysalis leporis-palustris* found in nature on cottontail rabbits in the Bitter Root Valley of western Montana. Although these strains appear to be serologically and immunologically identical with a laboratory strain of Rocky Mountain spotted fever rickettsia, and infection of guinea pigs with living rickettsiae affords protection against challenge with a virulent strain of spotted fever rickettsia, they are of low virulence for guinea pigs.

Conclusions

Although the rabbit tick, *Haemaphysalis leporis-palustris*, does not usually bite man, the finding of rickettsiae in this tick, which can be

classified as Rocky Mountain spotted fever rickettsiae, indicates that it may be of importance in maintaining spotted fever rickettsiae in nature among rabbits. The observation that all stages of *Dermacentor andersoni*, the tick most commonly involved in the transmission of the infection to man in the western United States, is also found on rabbits is of additional significance in assessing the role of the rabbit tick in maintaining this infection among a probable mammalian reservoir.

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A Rabbit-Ear Cage for Bloodsucking Arthropods

By PAUL A. WOKE, Sc.D.*

Various types of cages for bloodsucking arthropods, suited for long-term attachment to the animal host, are described in detail in the publications of Camin (1), Jellison and Philip (2), Rees (3), Sacktor et al. (4), and in accounts cited by these authors. The cage herein described appears to answer previously unfulfilled needs and to present desirable features not found in others.

This cage (fig. 1) is designed specifically for attachment to the heads of rabbits in such a manner as to make full use of the enclosed ears in providing for the feeding of bloodsucking arthropods. A transparent wall sloping upward and outward from the head and covered across its top by mesh material surrounds the erect ears, forming a cage elliptical in cross section and of large capacity, which permits good visibility throughout the interior and great ease in manipulations. The cage is light in weight, not easily damaged, and offers no important restriction to the normal activities of the host. It provides a high degree of security against escape of the confined arthropods, environmental conditions acceptable in a wide range of applications in culture and experimental study, and a degree of versatility unusual in such cages. A variety of sizes and shapes is obtainable and certain accommodations within the cage are possible by modifications of the basic plan.

The rabbit is a natural host to many bloodsucking arthropods and an acceptable host to others. The ears present a large, clean, easily manipulated feeding surface abundantly supplied with blood vessels. The hair is easily removed when a bared-skin surface is needed. By temperament the rabbit is well suited to this application, and several breeds are generally available. Although developed for the rabbit, the device may be adaptable to certain other animals.

Construction

The cage is constructed largely of transparent celluloid cut from sheets 0.01 inch in thickness. The top and necessary wall openings are covered with standard silk bolting cloth, bronze or copper wire cloth, or both. Materials having 18, 28, 40, 53, 60, 65, and 92 meshes per lineal inch have served all purposes in our experience. The wire cloth and often the entire cage may be reused.

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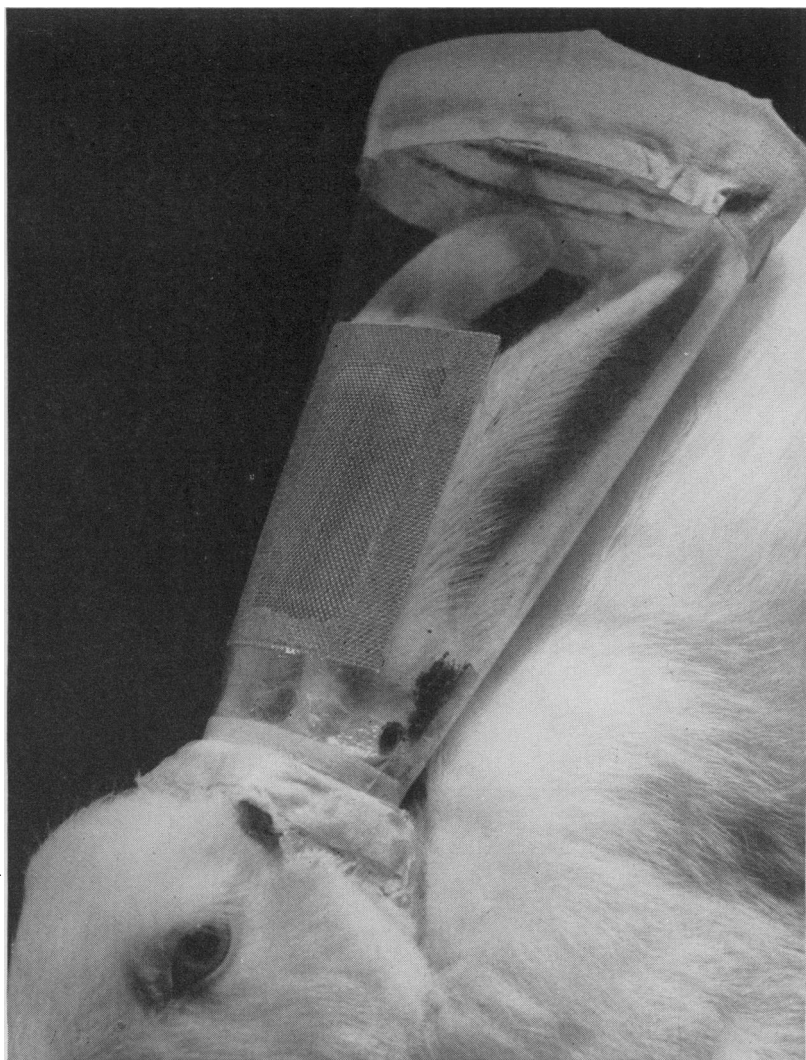


Figure 1. Photograph showing celluloid rabbit-ear cage in use, with mature ticks attaching to ears preparatory to engorgement. Note the method of attachment to the rabbit's head with flexible collodion, the position of the ears in relation to the cage, the visibility afforded, and a preferred position for the wire-cloth covered opening for ventilation.

The construction and attachment of a cage may be done quite simply and satisfactorily by trial, but when numbers of cages of varied sizes and shapes are to be used, more elaborate preparations are helpful. The shaping of the celluloid for the wall is aided by the use of templates and shaping forms which may be prepared for the construction of any useful sizes by the procedures given below with reference to figure 2.

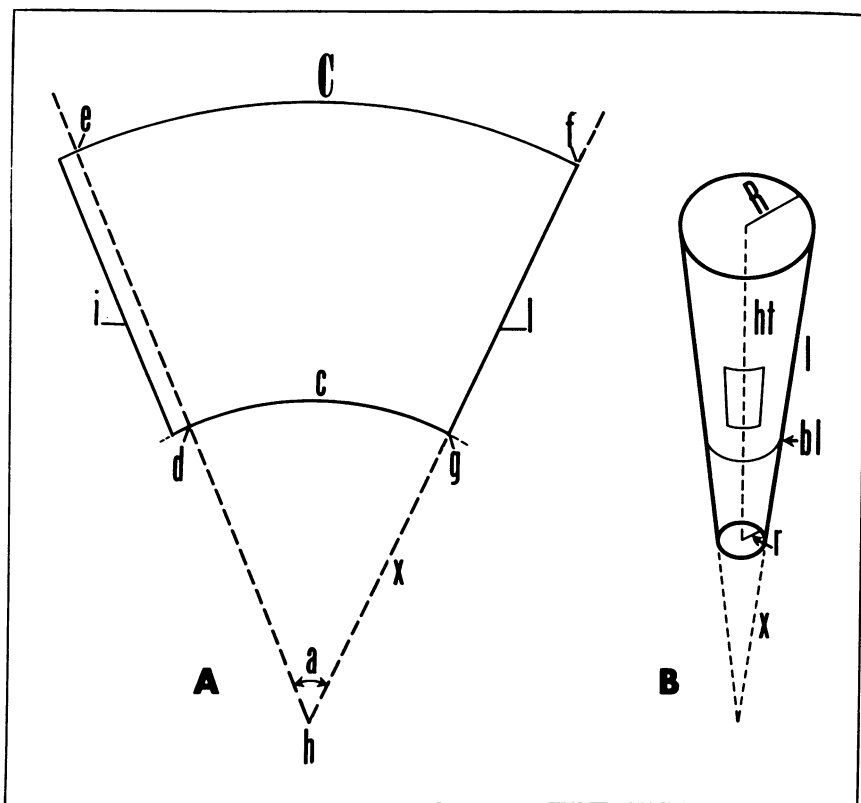


Figure 2. Diagrams illustrating methods in the preparation of the rabbit-ear cage. A. Preparation of pattern for cutting out celluloid wall; B. Preparation of form for shaping the celluloid wall.

Templates are cut from firm material such as pressed paperboard or heavy aluminum. The determining factors in preparing a pattern for a template are: (1) The width y of the head which is measured by outside calipers at the widest point immediately below the bases of the ears. The cage on being prepared for attachment to the rabbit's head will be given an elliptical form in cross section, and the long axis of the ellipse at the base rim should approximately equal the measurement y .

The short axis is taken for convenience as $\frac{2y}{3}$. Since the cage is conveniently prepared first in circular form in cross section, a required radius r for the base rim is derived by the formula $r = \sqrt{\frac{y^2}{6}}$. (2) The

length of the animal's ears, to which is added one-half inch to one inch for attachment of the cage and clearance below the cover, obtains required length l for the sloping side of the cage. (3) The required amount of expansion for the upper part of the cage, which determines the long axis of the ellipse, Y . Hence, by application of the formula

$R = \sqrt{\frac{Y^2}{6}}$, the radius R for the upper rim of the cage is found. (4)

Angle a is obtained by application of the formula $a = \frac{360(R-r)}{l}$.

To lay out a pattern, lines hf and he extended (fig. 2A) are constructed on angle a , and the formula $x = \frac{360r}{a}$ is applied to obtain x , the radius for arc c . Using x plus l as radius, arc C is constructed. The overlap i is a $\frac{3}{8}$ -inch extension along arcs c and C beyond radial line de . The completed pattern is represented by the area $defg$ plus overlap i .

The shaping form (fig. 2B) is suitably turned from a block of hard wood to the form of a frustum. A single form serves for the preparation of all cages employing the same side slope provided the diameters of the large and small ends are greater and less respectively than those of the extreme range of proposed cage sizes. Using the value for angle a previously chosen for the patterns and letting R and r represent the radii of circles for the large end and the small end respectively of the frustum, the side length l is determined by the formula $l = \frac{360(R-r)}{a}$.

Where feasible, the use of one cage shape reduces the number of required patterns to the minimum and the shaping forms to a single size. The table gives the radii for arcs c and C needed for preparing the three different sized patterns which have answered most requirements in our experience with the long-eared Albino New Zealand White breed of rabbit. The value of 47° for angle a used in the making of these three patterns, originally was determined from the pattern of a suitably shaped cage formed by trial. The side length l of $5\frac{1}{2}$ inches is about the minimum length usable with long-eared breeds. For short-eared rabbits approximately 1 inch may be deducted from the value given for the radius for arc C .

A shaping form $3\frac{1}{4}$ inches in diameter at the large end, 1 inch in diameter at the small end, and $8\frac{1}{2}$ inches in vertical height (fig. 2B, *ht*) serves for use with patterns made as above.

Radii required for the construction of 3 patterns, showing approximate correlation with weights of rabbits, and head measurements from which derived. Length $l = 5\frac{1}{2}$ inches. Angle $a = 47^\circ$

Approximate range in weights of rabbits (pounds)	Approximate width of head y (inches)	Base rim diameter of cage (inches)	Radius for arc c (inches)	Radius for arc C (inches)
3-4	1 $\frac{5}{8}$	1 $\frac{5}{16}$	5	10 $\frac{1}{2}$
4-5	1 $\frac{7}{8}$	1 $\frac{1}{2}$	5 $\frac{3}{4}$	11 $\frac{1}{4}$
5-7	2	1 $\frac{3}{8}$	6 $\frac{1}{4}$	11 $\frac{3}{4}$

The template is pressed firmly against a sheet of celluloid lying on a flat surface while a sharp, small-bladed knife is passed around its edge to cut out the piece which is to become the wall. The cut-out piece then is placed on the shaping form with its base coinciding with a predetermined marked base line (fig. 2B, *bl*) for the size cage being made. The overlap is sealed with acetone to the opposite edge and held firmly against the form for the few seconds required for setting.

Required openings are conveniently cut while the wall piece is on the form although standard openings may be cut from corresponding ones in the templates. Openings may be placed in any location. Those for ventilation serve best when placed near the base of the cage, on the front, back, or sides. The front position (fig. 1) is less subject to damage by the rabbit's claws. The corresponding positions of those that can be predetermined may be marked as guide lines on the shaping form, oriented with reference to a vertical line marking the position for the radial edge of the wall at the overlap. Shallow, narrow grooves, cut into the form, may serve as guide lines for cutting standard openings. Figure 2B shows guide lines for cutting an opening for ventilation 1 inch wide and 2 inches high, with its lower side 1 inch above the base rim of the cage. Reinforcement for those openings not to be covered by wire cloth may be provided by an extra ring of celluloid around the edges. Round openings and reinforcement rings may be neatly cut with sharp cork borers against a flat surface.

The celluloid is softened by immersion in warm water (60° C. for one minute is satisfactory) and immediately given the required elliptical shape by hand. Usually the overlap is best placed on one of the narrow sides rather than on the broad front or back.

Bolting cloth or wire cloth used to cover openings should be of the largest mesh known capable of preventing the escape of the smallest arthropods to be confined. Sections are cut with a $\frac{1}{4}$ -inch margin and attached to the wall by means of an acetone solution of celluloid. Wire cloth is put on the outer side. Bolting cloth when used is put on the inner side and protected by 18-mesh wire cloth. Any needed internal fixtures, such as a harborage arrangement, are now installed.

A 1-inch strip of gauze or light cloth is attached by means of acetone around the outer side of the wall at the base, approximately $\frac{1}{4}$ inch being attached to the wall and secured by a covering strip of celluloid. The lower free portion is slit in three places, and will be used to attach the cage to the head of the rabbit. Next a $\frac{1}{2}$ -inch width of surgical adhesive plaster is applied around the upper rim to reinforce the celluloid wall and to cover the sharp edge which otherwise might cut through the cloth covering to be applied later.

Attachment

The rabbit is immobilized on a board, and the hair on the head for a distance of about an inch around the base of the ears is clipped to a length of about $\frac{1}{16}$ to $\frac{1}{8}$ inch. Flexible collodion, used to attach the cage, is spread over the underside of the cloth and over the top and sides of the head about the base of the ears and allowed to dry partially. The cage is then lowered about the ears which are grasped through the top and moved from side to side to free the hair.

More collodion is added and the cloth spread out and pressed down. Collodion is spread over the upper side of the cloth and especially over strips of cloth laid over the slits, to give needed reinforcement. A final layer gives the "hood" a smooth surface. Drying is aided by a stream of warm, dry air. The adverse effect on the arthropods of the toxic collodion solvents is lessened by attachment of the cages approximately 24 hours before intended infestation. Secure attachment is greatly aided by proper fitting. The lower rim should fit snugly but not tightly to the bases of the ears front and back. Ample space for movement of the ears should be left between the wall and the ears on the sides. Strips of chamois may be secured between the ears and the wall to aid in producing a better fit. The need for adjustments due to growth during anticipated long-term use, may be reduced by selection of young mature animals and by looser fitting.

A bolting cloth cover of suitable mesh is attached with adhesive plaster. A $\frac{1}{2}$ -inch strip secures the gathered edges about the rim, while a covering 1-inch strip, turned over the rim for about $\frac{1}{4}$ inch to protect the cloth, secures the cover to the wall.

Need for repairs is determined on regular daily inspections. More collodion is forced under the hood as it is raised by the growing hair.

Use and Performance

The rabbit-ear cage, in continuous use since its origin in January 1949, has proved suitable to the requirements of the different stages of several species of bloodsucking arthropods including ticks, mites, lice, bedbugs, triatomine bugs, and fleas in biological and disease transmission experiments in which these arthropods have been fed, cultured, and subjected to observation and study. The ticks *Dermacentor andersoni*, *D. variabilis*, *Amblyomma americanum*, and *Rhipicephalus sanguineus* are fed to engorgement in all three stages by this means. In addition to routine rearing and life history studies, some of the special uses to which this cage has been put are in starting cultures from small numbers, adaptations of ectoparasites such as the human body louse and the dog flea to the rabbit as host, observations of sensitivity of the rabbit to bites of selected arthropods, and in

photography. It should serve well for certain types of insecticide and repellent testing. Important advantages of the cage in disease transmission studies over free infestation of the body of the host are: (1) The likelihood of feeding, whether the species is well or poorly adapted to the rabbit, is increased due to proximity. (2) Feeding and activities are readily observed and timing of the feeding period is easily accomplished. (3) Recoveries are practically 100 percent. (4) The chances for escape are reduced. (5) Ingestion by the host is prevented. (6) Litter and droppings of the host may be tested for the presence of the causative organism independently of the arthropods. (7) Feces and eggs of the arthropod under test are easily collected for test.

Since the cage is not intended for mass production, the maximum numbers of the several species and stages that can be accommodated without overcrowding have not been determined. However, in our experience, up to 2,700 larvae, 250 nymphs, or 25 adult females per cage of the above-mentioned ticks have engorged satisfactorily and without apparent harm to the host. Up to 1,000 fleas, *Ctenocephalides canis*, have fed freely for as long as 6 days, and 200 fed for 2 weeks, each group producing quantities of eggs, without serious injury to the host. Six weeks after an initial infestation with 275 mature lice and an unknown number of eggs, 4,000 human body lice were supported in the cage without apparent ill effects to the lice or to the host.

Numerous adaptations of the cage by variation of size, shape, and internal arrangements are useful. Cages for single ears are useful for such applications as small cultures, two separate cultures on the same host, comparative experiments, and for close observations. For photographing or for more precise observation, cages may be closely fitted to the ear or flattened wherever desired. The ear cage can provide protection for small cages attached directly to the ear. Openings for performing operations within the cage may be placed anywhere in the celluloid wall.

Bedbugs, lice, and some mites readily seek out and use prepared harborage, thus providing an easy means for removing the arthropods and their eggs from time to time. For this purpose, pieces of corrugated paper or patches of cloth, conveniently about 1 inch by 1½ inches, may be supported in racks of perforated celluloid or of large mesh metal screen attached to the wall about ¼ inch below the top rim where they are easily collected and replaced.

Arthropods and required materials are put into the cage through an opening in the cage wall or through the top before the attachment of the cloth cover, and recovered by means of an aspirator, forceps, a plastic spoon, or by removal of harborage. For infesting, small light capsules in which eggs have hatched may be opened and dropped into the cage. The cage may be inverted over cellucotton for the removal

of detached engorged adult female ticks. Upon death of infected hosts, the ears may be severed from the head, the ear openings plugged with cotton, and the contents of the cage examined when and where convenient.

Atmospheric conditions within the cage may be closely controlled when necessary since regulated forced air circulation is practical. Gaseous stimulants and anesthetics such as carbon dioxide and ammonia may be introduced in measured amounts and removed as required.

The cage itself appears to cause little discomfort. Certain arthropods, however, may be very irritating. Host rabbits fitted with ear cages may be kept in regular animal cages and provided for in a usual manner.

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Reported Incidence of Communicable Diseases in the United States, Fourth Quarter, 1950

This summary shows the cumulative totals of communicable disease cases taken from monthly reports submitted by the health departments of each State, Alaska, Hawaii, Panama Canal Zone, Puerto Rico, and the Virgin Islands for the fourth quarter of 1950. The figures should be regarded as provisional until final annual data are released by the States, but any changes probably will be small. Usefulness of the data is limited by the wide variation in completeness and accuracy of reporting which exist in the various States.

The table gives the reported cases of selected communicable diseases for each division and State in October, November, and December 1950. Data reported for diseases with low frequencies or by only a few States are given in the section "Additional Diseases."

Poliomyelitis

Approximately one-third of all cases reported in 1950 for the country as a whole were reported in the last quarter of the year. The peak week in incidence was not reached until the week ended September 23 which was later than usual. In some States nearly one-half of all cases occurring in 1950 were reported in the fourth quarter.

Diphtheria

The number of reported cases was much below that for the same quarter of 1949 and the 5-year median.

Scarlet Fever and Septic Sore Throat

The number of cases of scarlet fever showed a decrease compared with the same period last year and the 5-year median. However, there was an equivalent increase in reported cases of septic sore throat.

Measles

The reported incidence of measles was approximately one-third greater than for the same period of 1949, but only slightly greater than the 5-year median.

Additional Diseases

Figures for additional diseases reported by State health departments during the fourth quarter of 1950 and not shown in the table are given below. Also included are diseases reported by the Territories and

Reported Cases of Selected Communicable Diseases in the United States, Each Division and State, Fourth Quarter 1950

[Numbers under diseases are International List numbers, 1948 revision]

Area	Brucel- losis (044)	Chick- enpox (087)	Con- juncti- vitis ¹ (370)	Diph- theria (055)	Dysentery		
					Amebic (046)	Bacil- lary (045)	Unspec- ified (047, 048)
New England	24	5,822	7	41	11	25	
Maine.....	2	1,143		3			
New Hampshire.....		188		6			
Vermont.....	3	597		1			
Massachusetts.....	5	2,711		28	3	22	
Rhode Island.....	1	266		2		1	
Connecticut.....	13	917	7	1	8	2	
Middle Atlantic	66	10,980		81	303	198	1
New York.....	32	3,498		48	285	194	
New Jersey.....	13	3,879		10	16	1	1
Pennsylvania.....	21	3,603		23	2	3	
East North Central	195	14,484	52	121	152	74	8
Ohio.....	15	2,843		47	4	7	
Indiana.....	13	608		26	3	2	
Illinois.....	101	2,471	10	21	101	27	
Michigan.....	14	3,699	42	24	44	38	(*)
Wisconsin.....	52	4,863		3			8
West North Central	168	3,064	208	77	24	23	11
Minnesota.....	46	513	1	37	16	17	3
Iowa.....	65	173	4	8	3	2	
Missouri.....	17	370		24	3		8
North Dakota.....		202	190				
South Dakota.....	7	89		1	(*)	(*)	(*)
Nebraska.....	1	169		3	1		
Kansas.....	32	1,548	13	4	1	4	
South Atlantic	57	1,732	32	598	77	106	500
Delaware.....		35		2			1
Maryland.....	7	306		10	4	6	
District of Columbia.....		179				4	
Virginia.....	19	434		59	1		492
West Virginia.....	6	426	8	57	1	16	
North Carolina.....	8			193	33	16	
South Carolina.....				78	1	5	
Georgia.....	12	266	17	166	3	53	7
Florida.....	5	86	7	33	34	6	
East South Central	42	947	4	403	157	57	11
Kentucky.....	4	264	4	96	64	6	8
Tennessee.....	20	390		102	37	35	3
Alabama.....	6	293		135	5	(*)	(*)
Mississippi.....	12			70	51	16	(*)
West South Central	64	534		418	155	6,265	5,717
Arkansas.....	8	277		71	12	46	134
Louisiana.....	3	60		28	55		(*)
Oklahoma.....	17	197		44	4	12	21
Texas.....	36			275	84	6,207	5,562
Mountain	28	2,816	101	60	44	563	177
Montana.....	4	300	12	13	3	1	
Idaho.....	6	256	57	7	1		
Wyoming.....	2	140	2	3			
Colorado.....	7	813		10	1	9	
New Mexico.....		178		6	5	26	12
Arizona.....	5	360	4	16	30	527	164
Utah.....	1	689		4	4		
Nevada.....	3	80	26	1			1
Pacific	35	5,106	28	75	138	169	37
Washington.....	2			6	1	8	32
Oregon.....	5		28	16	36	1	5
California.....	28	5,106		53	101	160	(*)
Fourth quarter 1950.....	679	45,485	432	1,874	1,061	7,480	6,462
Fourth quarter 1949.....	827	50,105	357	2,858	1,304	7,032	6,677
Median 1945-49.....	1,262	50,129	322	4,359	945	5,898	2,143
Alaska.....		140	1				8
Hawaii.....	1	137	11	2	2	12	
Panama Canal Zone ²	1	43		5	27	13	
Puerto Rico ³		50		128			5
Virgin Islands ⁴		1					

* Reported not notifiable.

¹ For reported cases of "Ophthalmia neonatorum" see the section following tables.

² Covers September, October, and November.

³ From weekly reports.

⁴ Includes September.

Reported Cases of Selected Communicable Diseases in the United States, Each Division and State, Fourth Quarter 1950—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Encephalitis, acute infectious (082)	German measles (086)	Hook-worm disease (129)	Influenza (480-483)	Malaria (110-117)	Measles (085)	Menin- gitis, menin- gococcal (057.0)
New England	16	434	2	29	1	1,063	40
Maine.....	.....	67	.....	6	.....	36	9
New Hampshire.....	.....	14	.....	15	.....	88	2
Vermont.....	1	34	.....	.....	.....	283	1
Massachusetts.....	14	238	.....	(*)	1	481	19
Rhode Island.....	1	1	.....	2	.....	53	2
Connecticut.....	1	80	2	6	.....	142	7
Middle Atlantic	45	620	31	75	1	5,057	178
New York.....	40	252	31	24	1	1,612	93
New Jersey.....	4	205	.....	30	.....	1,065	15
Pennsylvania.....	1	163	.....	21	.....	2,380	70
East North Central	41	746	.....	436	2	8,225	158
Ohio.....	1	103	.....	33	1	1,960	52
Indiana.....	8	17	.....	56	.....	143	3
Illinois.....	11	106	.....	12	.....	1,908	54
Michigan.....	15	252	.....	15	.....	969	31
Wisconsin.....	6	268	.....	320	1	3,245	18
West North Central	21	37	.....	259	2	2,419	71
Minnesota.....	1	.....	.....	3	1	325	8
Iowa.....	6	.....	.....	.....	.....	53	9
Missouri.....	3	29	.....	25	1	1,116	23
North Dakota.....	5	.....	.....	34	.....	113	4
South Dakota.....	5	.....	.....	.....	.....	63	3
Nebraska.....	.....	.....	.....	180	.....	22	8
Kansas.....	1	8	.....	17	.....	727	16
South Atlantic	13	33	3,323	5,066	26	1,490	117
Delaware.....	.....	.....	.....	.....	.....	36	3
Maryland.....	1	23	.....	12	1	40	9
District of Columbia.....	1	.....	.....	9	.....	42	1
Virginia.....	2	.....	.....	3,271	4	407	26
West Virginia.....	1	1	.....	1,150	.....	338	12
North Carolina.....	1	.....	.....	.....	4	288	29
South Carolina.....	.....	.....	.....	338	5	29	10
Georgia.....	3	.....	.....	255	11	254	15
Florida.....	4	9	3,323	31	1	46	12
East South Central	19	33	895	576	22	1,075	91
Kentucky.....	2	8	106	46	.....	622	25
Tennessee.....	9	22	2	260	2	231	42
Alabama.....	1	3	.....	231	15	35	12
Mississippi.....	7	.....	787	39	5	187	12
West South Central	24	31	261	21,996	218	2,268	91
Arkansas.....	6	5	8	1,583	2	388	7
Louisiana.....	1	.....	239	7	1	112	6
Oklahoma.....	4	26	14	991	18	235	10
Texas.....	13	.....	.....	19,415	197	1,533	68
Mountain	10	296	.....	2,309	9	2,369	21
Montana.....	.....	39	.....	133	.....	64	.....
Idaho.....	2	69	.....	175	.....	337	2
Wyoming.....	1	45	.....	.....	.....	130	4
Colorado.....	2	52	.....	219	2	1,284	9
New Mexico.....	1	5	.....	3	.....	144	1
Arizona.....	4	55	.....	1,622	5	120	3
Utah.....	.....	31	.....	9	.....	217	2
Nevada.....	.....	.....	.....	148	2	73	.....
Pacific	140	611	1	204	4	3,587	82
Washington.....	5	.....	.....	29	.....	1,132	24
Oregon.....	.....	.....	1	93	.....	168	10
California.....	135	611	.....	82	4	2,287	48
Fourth quarter 1950.....	329	2,841	4,513	30,950	285	27,563	849
Fourth quarter 1949.....	191	2,483	4,302	8,434	627	18,179	837
Median 1945-49.....	145	2,483	4,061	32,724	2,893	25,449	837
Alaska.....	.....	6	.....	42	.....	10	5
Hawaii.....	.....	19	.....	1,287	1	24	1
Panama Canal Zone ².....	.....	1	.....	6	46	70	3
Puerto Rico ³.....	.....	.....	.....	215	18	986	.....
Virgin Islands ⁴.....	.....	.....	.....	.....	.....	.....	.....

* Reported not notifiable.

¹ New York City only.

² Covers September, October, and November.

³ From weekly reports.

⁴ Includes also September.

Reported Cases of Selected Communicable Diseases in the United States, Each Division and State, Fourth Quarter 1950—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Mumps (089)	Pneumonia (490-493)	Poliomyelitis				Rheumatic fever (400-402)
			Total (080.0-080.3)	Paralytic (080.0-080.1)	Non-paralytic (080.2)	Unspecified (080.3)	
New England	2,840	566	439	175	106	158	31
Maine.....	169	117	31	22	8	1	4
New Hampshire.....	85	1	9	.....	.....	9	.....
Vermont.....	471	11	8	.....	.....	8	.....
Massachusetts.....	1,710	(*)	200	109	71	20	(*)
Rhode Island.....	10	13	13	.....	.....	13	27
Connecticut.....	395	424	178	44	27	107	(*)
Middle Atlantic	7,063	3,954	2,346	.....	.....	2,346	135
New York.....	1,791	2,715	1,567	.....	.....	1,567	(*)
New Jersey.....	2,811	616	283	.....	.....	283	(*)
Pennsylvania.....	2,461	623	496	.....	.....	496	135
East North Central	7,253	1,444	3,140	883	666	1,591	175
Ohio.....	924	(*)	818	.....	.....	818	14
Indiana.....	231	178	297	91	33	173	2
Illinois.....	757	686	708	394	276	38	31
Michigan.....	2,370	440	942	398	357	187	128
Wisconsin.....	2,971	140	375	.....	.....	375	.....
West North Central	988	2,485	1,267	152	70	1,045	41
Minnesota.....	6	1,431	245	138	65	42	38
Iowa.....	270	29	451	.....	.....	451	1
Missouri.....	173	153	154	.....	.....	154	.....
North Dakota.....	.....	702	9	.....	.....	9	2
South Dakota.....	43	3	84	.....	.....	84	(*)
Nebraska.....	247	48	157	.....	.....	157	(*)
Kansas.....	249	119	167	14	5	148	.....
South Atlantic	1,325	2,057	1,443	432	110	901	77
Delaware.....	35	4	10	.....	.....	10	.....
Maryland.....	394	255	282	201	81	.....	13
District of Columbia.....	63	132	37	18	19	.....	1
Virginia.....	266	623	318	.....	.....	318	34
West Virginia.....	259	129	121	.....	.....	121	5
North Carolina.....	.....	.....	202	.....	.....	202	.....
South Carolina.....	.....	135	77	.....	.....	77	7
Georgia.....	124	595	201	192	9	.....	17
Florida.....	184	184	195	21	1	173	(*)
East South Central	390	1,334	509	359	20	100	99
Kentucky.....	204	386	190	151	7	32	7
Tennessee.....	95	411	151	151	(*)	(*)	20
Alabama.....	91	290	56	.....	.....	56	58
Mississippi.....	.....	247	112	87	13	12	14
West South Central	580	3,921	766	94	92	580	19
Arkansas.....	274	396	81	17	53	11	3
Louisiana.....	14	148	109	71	38	(*)	6
Oklahoma.....	292	220	103	6	1	96	10
Texas.....	.....	3,157	473	(*)	(*)	473	(*)
Mountain	2,543	656	331	119	26	186	63
Montana.....	205	17	18	6	3	9	1
Idaho.....	224	83	54	.....	.....	54	9
Wyoming.....	102	8	9	6	1	2	2
Colorado.....	385	228	86	67	10	9	16
New Mexico.....	147	75	60	40	12	8	7
Arizona.....	332	223	71	.....	.....	71	25
Utah.....	1,081	7	33	.....	.....	33	3
Nevada.....	67	15	.....	.....	.....	.....	.....
Pacific	3,241	790	1,422	540	133	749	128
Washington.....	.....	166	286	32	.....	254	43
Oregon.....	.....	149	247	171	39	37	15
California.....	3,241	465	889	337	94	458	70
Fourth quarter 1950.....	26,223	17,197	11,663	2,784	1,223	7,656	768
Fourth quarter 1949.....	30,376	18,098	9,551	1,937	793	6,821	786
Median 1945-49.....	25,261	18,098	6,505	(1)	(1)	(1)	1,021
Alaska.....	71	19	158	.....	.....	58	12
Hawaii.....	30	8	8	8	.....	.....	13
Panama Canal Zone ²	375	138	45	.....	.....	45	.....
Puerto Rico ³.....	.....	.....	3	.....	.....	3	.....
Virgin Islands ⁴.....	.....	.....	.....	.....	.....	.....	.....

* Reported not notifiable.

¹ Not available.

² Covers September, October, and November.

³ From weekly reports.

⁴ Includes also September.

Reported Cases of Selected Communicable Diseases in the United States, Each Division and State, Fourth Quarter, 1950—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Rocky Mountain spotted fever (104)	Scarlet fever (050)	Septic sore throat (051)	Small-pox (084)	Tetanus (061)	Trachoma (095)	Trichiniasis (128)
New England.....		1,256	86		4		20
Maine.....		141	13				
New Hampshire.....		177	(1)				
Vermont.....		46					
Massachusetts.....		827	26		1		12
Rhode Island.....		31	2				3
Connecticut.....		134	45		3		5
Middle Atlantic.....	3	1,753	16		7		27
New York.....	2	1,899	(1)		5		22
New Jersey.....		243	16		1		4
Pennsylvania.....	1	611			1		1
East North Central.....	1	3,386	89	1	15	2	4
Ohio.....	1	1,151	2	1	2		3
Indiana.....		253	1		3		
Illinois.....		502	17		6		1
Michigan.....		1,162	55		4		
Wisconsin.....		318	14			2	
West North Central.....		762	84	7	9	304	1
Minnesota.....		150	76		2		1
Iowa.....		118			1		
Missouri.....		162	3	1	1	304	
North Dakota.....		31	3	1	1		
South Dakota.....		13			1		
Nebraska.....		183	(1)	5			
Kansas.....		205	2		3		
South Atlantic.....	24	1,968	829		31	26	1
Delaware.....		27					
Maryland.....	3	114	2		3		1
District of Columbia.....		82					
Virginia.....	12	293	632		3		
West Virginia.....	1	161	69			26	
North Carolina.....	4	896	8		1		
South Carolina.....		88	12		1		
Georgia.....	4	229	79		14		
Florida.....		78	27		10		(*)
East South Central.....	4	1,391	71	5	33	2	1
Kentucky.....		382	22	4		1	
Tennessee.....		669	49	1	12	1	1
Alabama.....	2	244	(*)		10		(*)
Mississippi.....	2	96	(*)		10		(*)
West South Central.....	2	742	2,586		13	59	
Arkansas.....	1	63	500		2	29	
Louisiana.....		62	1		11		
Oklahoma.....	1	144	66			11	
Texas.....		473	2,019		(*)	19	(*)
Mountain.....		522	1,076		2	179	
Montana.....		70	25			74	
Idaho.....		79	103		2		
Wyoming.....		5					
Colorado.....		109	44				
New Mexico.....		31	2			3	
Arizona.....		52	643			99	
Utah.....		172	4				
Nevada.....		4	255			3	
Pacific.....	1	1,980	294		9	4	19
Washington.....		583	23				13
Oregon.....	1	179	67		1	3	
California.....		1,218	114		8	1	6
Fourth quarter 1950.....	35	13,760	5,041	13	123	576	73
Fourth quarter 1949.....	31	14,510	3,830	5	123	255	69
Median 1945-49.....	35	19,522	3,830	20	123	348	77
Alaska.....		1	4				
Hawaii.....		18			2		
Panama Canal Zone ²					3		
Puerto Rico ³					28		
Virgin Islands ⁴							

* Reported not notifiable. ¹ Cases reported as septic sore throat included with scarlet fever.

² Covers September, October, and November. ³ From weekly reports. ⁴ Includes also September.

Reported Cases of Selected Communicable Diseases in the United States, Each Division and State, Fourth Quarter 1950—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Tuberculosis		Tula-remia	Typhoid fever	Para-typhoid fever ¹	Typhus fever, endemic	Whoop-ing cough
	All forms (001-019)	Respir-atory (001-008)					
New England	1,284	1,140		15	18		3,434
Maine	108	91		6	1		579
New Hampshire	61			3	1		90
Vermont	74	74					768
Massachusetts	619	587		4	8		1,053
Rhode Island	131	118		1	1		495
Connecticut	291	270		1	7		449
Middle Atlantic	5,068	2,907	8	75	38		3,671
New York	3,213	2,907	1	22	30		1,453
New Jersey	729		1	7	2		1,271
Pennsylvania	1,126		6	46	6		947
East North Central	4,372	2,245	41	88	45		4,896
Ohio			4	43	1		941
Indiana	472	443	12	10	3		484
Illinois	1,925	1,802	21	19	1		460
Michigan	1,769	(*)	3	13	40		1,559
Wisconsin	206		1	3			1,452
West North Central	1,665	220	8	35	7		1,394
Minnesota	520				2		199
Iowa	231			3			265
Missouri	565		8	22	2		197
North Dakota	67	64		1	1		131
South Dakota	53						31
Nebraska	70			2	1		104
Kansas	159	156		7	1		467
South Atlantic	4,401	3,470	32	107	24	51	2,490
Delaware	74	74		7	1		50
Maryland	639	611	3	10	1		284
District of Columbia	406	383		3	1		59
Virginia	819	798	11	18	2	2	737
West Virginia	474	152	1	17			369
North Carolina	804	776	6	10	1	3	577
South Carolina						8	75
Georgia	694	676	9	25	13	32	189
Florida	491		2	7	5	6	150
East South Central	3,027	935	28	63	6	15	899
Kentucky	702	676	4	8	1		277
Tennessee	893	(*)	11	30	2	2	285
Alabama	1,166	(*)	2	8	3	11	277
Mississippi	266	259	11	17		2	60
West South Central	2,671	1,532	36	120	19	44	2,549
Arkansas	615	611	15	23			377
Louisiana	530	514	5	26	6	9	87
Oklahoma	409	407	8	11	4		122
Texas	1,117	(*)	8	60	9	35	1,963
Mountain	1,425	889	17	46	10	1	1,350
Montana	102	100	5	2		1	241
Idaho	23			5	6		86
Wyoming	17	12	2	2			35
Colorado	453		1	3	1		200
New Mexico	150	137		23			191
Arizona	615	609		9			482
Utah	31	31	8	1	2		93
Nevada	34		1	1	1		22
Pacific	2,945	2,376	1	31	78	4	1,069
Washington	457			7	18		287
Oregon	146	134	1	5			112
California	2,342	2,242		19	60	4	670
Fourth quarter 1950	26,858	15,714	171	580	245	115	21,752
Fourth quarter 1949	27,532	15,903	260	574	335	237	22,230
Median 1945-49	29,976	12,272	260	710	273	332	26,205
Alaska				3			41
Hawaii	105					4	11
Panama Canal Zone ²	198	152		1	2		19
Puerto Rico ³	946			17		7	158
Virgin Islands ⁴	4	4					120

* Reported not notified separately.

¹ Includes salmonellosis.

² Covers September, October, and November.

³ From weekly reports.

⁴ Includes also September.

possessions. Figures for the Panama Canal Zone are for September to November; Puerto Rico (from weekly reports); and Virgin Islands for September to December. The numbers in parentheses are from the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, World Health Organization, 1948.

Actinomycosis (132): Connecticut 1, Georgia 3, Iowa 2, Michigan 1, Minnesota 3, South Dakota 1, Tennessee 1.

Anthrax (062): California 1, Massachusetts 1, New Hampshire 4, New Jersey 2, Pennsylvania 8.

Botulism (049.1): California 4, Minnesota 1, New Mexico 1, Tennessee 1.

Cancer (140-205): Alabama 1,122, Arkansas 113, Colorado 658, Florida 1,090, Georgia 58, Idaho 151, Kansas 1,660, Louisiana 694, Montana 341, Nevada 15, New Mexico 173, North Dakota 187, Pennsylvania 2,129, South Carolina 64, Tennessee 812, Utah 56, Wyoming 130, Alaska 2, Virgin Islands 4.

Coccidioidomycosis (133): Arizona 69, Oklahoma 1, Oregon 16.

Dengue (090): Texas 1.

Diarrhea of the newborn (764): California 67, Florida 5, Illinois 67, Iowa 2, Maryland 5, Minnesota 1, New Mexico 13, New York 7, Ohio 28, Oklahoma 2, Pennsylvania 6, Rhode Island 5, Washington 1.

Diarrhea, unspecified (571): Florida 23, Kentucky 34, Maryland 6, Michigan 21, Minnesota 11, Montana 36, New Mexico 62, New York 42, Ohio 285, Rhode Island 14, South Carolina 11, Wyoming 93, Alaska 68.

Encephalitis, myelitis, and encephalomyelitis, except acute infectious (343): Colorado 2, Missouri 1, Montana 2, North Carolina 2, Ohio 4, Washington 3.

Erysipelas (052): Arkansas 1, Colorado 1, Connecticut 4, Florida 4, Idaho 5, Illinois 20, Indiana 4, Kentucky 3, Louisiana 3, Maryland 1, Michigan 17, Missouri 2, Oregon 5, Pennsylvania 9, Tennessee 7, Vermont 1, Wisconsin 6, Alaska 1.

Favus (131 part): Missouri 1, Nevada 1.

Food poisoning (049): California 155, Connecticut 3, Florida 6, Illinois 41, Indiana 33, Kentucky 2, Minnesota 20, Nevada 135, New Jersey 5, New Mexico 129, New York 445, Ohio 19, Oklahoma 33, Oregon 7, Pennsylvania 43, Alaska 2, Panama Canal Zone 5.

Glandular fever—infectious mononucleosis (093): Arizona 18, Connecticut 41, Idaho 6, Kentucky 8, Maryland 5, Michigan 43, Minnesota 113, Montana 1, Nebraska 40, Ohio 1, Pennsylvania 3, Tennessee 10, Washington 28, Alaska 1.

Hepatitis, infectious (092): Connecticut 5, Idaho 3, Illinois 11, Indiana 8, Maine 6, Massachusetts 8, Michigan 32, Minnesota 3, Montana 2, Nevada 2, New York 50, Oregon 36, Pennsylvania 202, Utah 8, Washington 12, Wyoming 6, Alaska 1, Hawaii 1, Panama Canal Zone 29.

Impetigo (695, 766): Colorado 11, Idaho 31, Illinois 4, Indiana 14, Iowa 2, Kansas 4, Kentucky 47, Michigan 378, Missouri 24, Montana 10, Nevada 36, New York 37, Ohio 11, Wyoming 1, Alaska 1, Hawaii 65.

Leprosy (060): California 5, Connecticut 1, Florida 1, Louisiana 1, Missouri 1, Oregon 1, Texas 1, Alaska 2, Hawaii 2.

Meningitis, except meningococcal and tuberculous (340): Colorado 4, Idaho 2, Illinois 41, Indiana 18, Iowa 6, Kentucky 7, Maryland 6, Massachusetts 36, Michigan 10, Minnesota 17, Mississippi 15, Missouri 3, Montana 3, New Mexico 2, New York 42, Ohio 28, Rhode Island 7, Washington 22, Wyoming 1.

Ophthalmia neonatorum (033, 765) for cases of "Conjunctivitis" see table: Arizona 1, Arkansas 1, California 3, Connecticut 1, Florida 6, Georgia 1, Illinois 13, Massachusetts 38, Michigan 5, Mississippi 5, New Jersey 1, New Mexico 2,

New York 5, Ohio 100, Pennsylvania 2, South Carolina 1, Tennessee 4, Texas 16, Wisconsin 1.

Pellagra (281): Alabama 8, Arizona 1, Arkansas 1, Georgia 17, New Mexico 1, Tennessee 11.

Psittacosis (096.2): California 4, Massachusetts 1.

Rabies (094): Missouri 1, North Carolina 2.

Relapsing fever (071): Nevada 4, Texas 6.

Rickettsialpox (108): New York City 22.

Ringworm of the scalp (131, part): Arkansas 1, Connecticut 31, Florida 2, Georgia 35, Illinois 305, Indiana 96, Iowa 135, Kansas 55, Kentucky 35, Maryland 1, Minnesota 13, Missouri 29, Nevada 17, Oklahoma 12, Oregon 52, South Carolina 6, Utah 12, Virginia 104, Washington 336.

Scabies (135): Idaho 21, Indiana 14, Kansas 8, Kentucky 112, Maryland 4, Michigan 224, Missouri 15, Montana 4, Nevada 24, North Dakota 10, Pennsylvania 31, Alaska 3.

Shistosomiasis (123): New York 20.

Vincent's infection (070): Colorado 22, Florida 23, Georgia 34, Idaho 12, Illinois 26, Indiana 2, Kansas 18, Kentucky 8, Maryland 2, Montana 1, Nevada 16, New Hampshire 1, Oklahoma 31, South Dakota 3, Tennessee 30, Alaska 1.

Weil's disease (072): Massachusetts 1, Michigan 1, Hawaii 1.

* * * * * * *

Rabies in animals: Alabama 43, Arizona 1, Arkansas 28, California 24, Colorado 2, Florida 2, Georgia 61, Illinois 15, Indiana 106, Iowa 68, Kansas 5, Kentucky 113, Michigan 61, Minnesota 13, Mississippi 15, New York 251, Ohio 44, Oklahoma 14, Oregon 1, Pennsylvania 15, South Carolina 83, Tennessee 57, Texas 326, Virginia 14, West Virginia 17, Wisconsin 2.

Incidence of Disease ,

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

UNITED STATES ,

Reports From States for Week Ended March 24, 1951

Influenza

In collaboration with the Influenza Information Center, National Institutes of Health, the following report on influenza has been prepared.

A substantial decrease in reported cases of influenza was reported for the current week, 12,699 cases compared with 16,290 for the previous week. The cumulative total for the first 12 weeks of 1951 is 81,216 compared with 92,515 for the same period of 1950. The number of deaths from all causes for the current week in large cities was over the 3-year median only in the Pacific region. In that area the number for the current week was 23.3 percent over the median.

Dr. Thomas Francis, Jr., Director of the Regional Laboratory at the University of Michigan, reports that there has been an extensive prevalence of influenza throughout the Ann Arbor area. A-prime influenza virus has been isolated there and from several nearby communities. One strain of influenza C virus also has been isolated, and serologic tests of the patient's sera were positive for this strain.

Dr. Harry M. Rose of Columbia University, New York City, reports the isolation of six strains of influenza virus from patients whose onsets were between February 8 and 23, 1951. All six strains may be classified in the A-prime group, but some differences exist among them.

Dr. S. F. Kalter of the collaborating laboratory at Syracuse University, reports the isolation of four strains of influenza virus from throat washings during the current outbreak. Three of these appear to be identical and related to the FM-1 strain of the A-prime type, and hemagglutination inhibition tests on paired sera from the patients indicate significant antibody increases to the FM-1 strain. The fourth strain appears to be type B, and paired sera from this patient showed a fourfold increase to his own strain, a sixteenfold increase to the Lee strain, and a fourfold increase to the FM-1 strain by hemagglutination inhibition tests.

The Surgeon General's Office of the Army reports that the Second Army Medical Laboratory had found four of six paired sera from Fort Eustis, Va., positive by the hemagglutination inhibition test for influenza virus types A and A-prime. The onsets of illness were

between February 15 and 28. Of two paired serum specimens from Camp Holabird, one was positive with type A-prime. One paired serum specimen from Aberdeen Proving Ground, Md., was also positive with type A-prime.

Dr. A. A. Jenkins, Utah State Department of Health, reports that for the week ended March 9, 265 cases of influenza were reported in Davis County (population, 30,000). Sore throat, muscular pains, and fever were frequent symptoms. Paired serum specimens are being obtained for examination at the State University School of Medicine. Unofficial reports of a similar type of disease in other parts of the State were also received, suggesting widespread prevalence in the State.

An estimation of the prevalence of the influenzalike illness in the San Joaquin Local Health District in California was determined by a questionnaire sent to physicians. About one-half of the families in the area were involved, and within family groups 50 to 75 percent were afflicted. From this information it was estimated that one-third of the population in San Joaquin County had an influenzalike illness. The Regional Laboratory at Berkeley, Calif., reports that of 109 paired sera tested in the week of March 10 to 16, 51 showed a rise in complement-fixing titer for influenza A. One paired sera showed a significant rise in titer for type B in the complement fixation test.

Measles

There was a slight decrease in the number of cases reported for the current week (17,575) as compared with the previous week (17,914). The cumulative total for the first 12 weeks of 1951 is 156,945 compared with 86,141 for the same period last year.

Epidemiological Reports

Rabies

The Animal Health Laboratory, South Dakota Agricultural College, has reported an outbreak of rabies among skunks, dogs, cattle, and civet cats in the eastern part of the State. It is also reported that an epizootic of rabies in wild animals of Iowa and Minnesota is moving west and northward. In Day County, S. Dak., an organized program is being inaugurated to reduce the wild animal population.

The Washington State Health Department reports rabies among dogs in Spokane. Control measures have been instituted by health and agricultural authorities.

Infectious Hepatitis

Dr. R. M. Albrecht, New York State Department of Health, has reported three cases of infectious hepatitis in a general hospital in

the eastern part of the State. Two were student nurses and one was an employee. Dates of onset were December 20, January 1, and January 14. All the cases had been in contact with each other. No common source of infection is suspected.

Anthrax

Dr. W. A. Longshore, California Department of Public Health, reports that two cases of anthrax occurred in the State during February. A 4-year-old boy developed a malignant pustule on the leg. A lamb which had been brought into the home for bottle feeding was given as the source. A sheepherder was reported to have anthrax, and sick sheep were found in his herd.

Diphtheria

Dr. W. A. Longshore, in a supplementary report, states that 10 cases with 2 deaths from diphtheria occurred in Humboldt County (previously reported in the Communicable Disease Summary for the week ended January 27). The fatal cases were a 7-year-old boy and his 45-year-old father. This report comments that the outbreak is an example of the changing pattern which diphtheria is showing in California. Cases are occurring in adults chiefly in the low socio-economic groups and occasionally in children who have not had adequate protection.

Comparative Data for Cases of Specified Reportable Diseases: United States

[Numbers after diseases are International List numbers, 1948 revision]

Disease	Total for week ended—		5-year median 1946-50	Seasonal low week	Cumulative total since seasonal low week		5-year median 1945-46 through 1949-50	Cumulative total for calendar year—		5-year median 1946-50
	Mar. 24, 1951	Mar. 25, 1950			1950-51	1949-50		1951	1950	
Anthrax (062).....	1			(1)	(1)	(1)		17	5	11
Diphtheria (055).....	90	114	160	27th	4,005	6,171	8,904	1,098	1,900	2,546
Encephalitis, acute infectious (082).....	22	17	7	(1)	(1)	(1)	(1)	171	154	97
Influenza (480-483).....	12,699	17,954	2,578	30th	295,758	103,099	103,099	281,216	92,515	88,166
Measles (085).....	17,575	11,940	21,613	35th	185,646	105,271	210,368	156,945	86,141	175,422
Meningitis, meningococcal (057.0).....	100	116	106	37th	2,267	2,026	2,011	1,306	1,112	1,040
Pneumonia (490-493).....	2,091	3,147	(3)	(1)	(1)	(1)	(1)	24,154	30,709	(3)
Poliomyelitis, acute (080).....	41	62	33	11th	41	62	33	1,253	1,193	643
Rocky Mountain spotted fever (104).....	1			(1)	(1)	(1)	(1)	4	11	11
Scarlet fever (050) ¹	2,206	1,993	2,933	32d	543,294	38,012	56,733	527,603	21,573	32,977
Smallpox (084).....		1	3	35th	14	34	54	6	13	33
Tularemia (059).....	17	19	20	(1)	(1)	(1)	(1)	168	273	273
Typhoid and paratyphoid fever (040, 041) ²	30	48	45	11th	30	48	45	465	558	522
Whooping cough (056).....	1,292	2,901	2,198	39th	40,759	52,571	52,571	19,157	31,035	26,857

¹ Not computed.

² Delayed report: Maine, week ended Mar. 17, 1,323 cases.

³ Data not available.

⁴ Including cases reported as streptococcal sore throat.

⁵ Deduction: Arkansas, week ended Mar. 17, 2 cases.

⁶ Including cases reported as salmonellosis.

Reported Cases of Selected Communicable Diseases: United States, Week Ended Mar. 24, 1951

[Numbers under diseases are International List numbers, 1948 revision]

Area	Diph- theria (055)	Enceph- alitis, in- fectious (082)	Influ- enza (480-483)	Measles (085)	Menin- gitis, menin- gococcal (057.0)	Pneu- monia (490-493)	Polio- myelitis (080)
United States.....	90	22	12, 699	17, 575	100	2, 091	41
New England.....	5		2, 431	647	2	180	
Maine.....	1		1, 563	3		56	
New Hampshire.....	1		191	15		11	
Vermont.....			41	94			
Massachusetts.....	4			482	2		
Rhode Island.....			6	5			
Connecticut.....			630	48		113	
Middle Atlantic.....	19	9	290	1, 913	14	366	4
New York.....	3	8	1, 222	643	8	118	4
New Jersey.....	3	1	68	335		138	
Pennsylvania.....	13			935	6	110	
East North Central.....	2	5	76	2, 645	22	165	2
Ohio.....				569	9		1
Indiana.....	2	2	39	228	2	15	
Illinois.....		2	7	330	4	55	
Michigan.....		1	30	552	3	95	
Wisconsin.....				966	4		1
West North Central.....	5	1	21	1, 090	1	19	6
Minnesota.....			2	64	1	5	1
Iowa.....	2			84			1
Missouri.....			1	340			1
North Dakota.....	1		11	40		7	
South Dakota.....	2	1		19			1
Nebraska.....				14			
Kansas.....			7	529		7	2
South Atlantic.....	15	1	2, 500	1, 676	19	225	3
Delaware.....			46	10			
Maryland.....	5		13	109	2	45	
District of Columbia.....				31		12	
Virginia.....			804	599	3	86	
West Virginia.....	1		734	147	2	30	1
North Carolina.....	6			84	4		
South Carolina.....	2		427	28	4	20	
Georgia.....	1		476	641	2	32	
Florida.....		1		27	2		2
East South Central.....	11	2	220	464	6	83	2
Kentucky.....			90	231		5	
Tennessee.....	3	1	101	79	3		
Alabama.....	5	1		30	3	44	1
Mississippi.....	3		29	124		34	1
West South Central.....	22	1	933	4, 490	19	708	5
Arkansas.....	2		821	593	2	140	
Louisiana.....	1		19	89	1	49	2
Oklahoma.....	2		93	258		46	
Texas.....	17	1		3, 550	16	473	3
Mountain.....	7	1	2, 217	1, 849	3	174	7
Montana.....	1		50	301		2	
Idaho.....	1			29			2
Wyoming.....				81		2	
Colorado.....	1	1	22	674	2	14	3
New Mexico.....			60	60		65	
Arizona.....	4		2, 132	614	1	91	2
Utah.....				45			
Nevada.....				45			
Pacific.....	4	2	4, 011	2, 801	14	171	12
Washington.....	2		1, 204	570	3	36	2
Oregon.....	1		1, 965	109	2	55	3
California.....	1	2	842	2, 122	9	80	7
Alaska.....			45				
Hawaii.....				3			

¹ New York City only.

Anthrax: Pennsylvania, 1 case.

Reported Cases of Selected Communicable Diseases: United States, Week Ended Mar. 24, 1951—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Rocky Mountain spotted fever (104)	Scarlet fever (050)	Small-pox (084)	Tularemia (059)	Typhoid and paratyphoid fever ¹ (040, 041)	Whooping cough (056)	Rabies in animals
United States	1	2, 206		17	30	1, 292	137
New England	211				2	96	
Maine	17					20	
New Hampshire	² 21					2	
Vermont	8					10	
Massachusetts	142				2	46	
Rhode Island	5					15	
Connecticut	18					3	
Middle Atlantic	342				1	199	10
New York	² 175					84	10
New Jersey	58					56	
Pennsylvania	109				1	59	
East North Central	701			5	1	122	11
Ohio	166					22	3
Indiana	62				1	10	5
Illinois	83			4		13	1
Michigan	318			1		49	1
Wisconsin	72					28	1
West North Central	117			3	1	61	10
Minnesota	26					3	
Iowa	10					9	10
Missouri	36			3	1	7	
North Dakota	1					2	
South Dakota	1					5	
Nebraska	8					7	
Kansas	35					28	
South Atlantic	203			2	8	196	28
Delaware	2					1	
Maryland	27				1	9	
District of Columbia	10				1	1	
Virginia	44			1		103	8
West Virginia	17					13	2
North Carolina	59					24	
South Carolina	4				1	20	12
Georgia	24			1	5	24	6
Florida	² 16					1	
East South Central	1	64		1	7	44	29
Kentucky		7				7	9
Tennessee	1	41			5	11	4
Alabama		12		1		22	10
Mississippi		4			2	4	6
West South Central		98		5	6	344	41
Arkansas				5		42	11
Louisiana		16			2	4	
Oklahoma		30			1	13	2
Texas		52			3	285	28
Mountain		156		1	1	181	1
Montana		5				2	
Idaho		36				7	
Wyoming		1		1		5	
Colorado		11			1	12	
New Mexico		4				10	
Arizona		3				139	1
Utah		² 96				6	
Nevada							
Pacific		314			3	49	7
Washington		112				13	4
Oregon		37			1	8	
California		² 165			2	28	3
Alaska		3				1	
Hawaii		1					

¹ Including cases reported as salmonellosis.

² Including cases reported as streptococcal sore throat.

FOREIGN REPORTS

CANADA

Reported Cases of Certain Diseases—Week Ended Mar. 10, 1951

Disease	Total	New-found-land	Prince Ed-ward Island	Nova Scotia	New Brunsw-ick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Al-bertha	Brit-ish Co-lumb-ia
Brucellosis	3					1				2	
Chickenpox	946	1		19		230	467	34	20	55	120
Diphtheria	5						1	1	3		
Dysentery, bacillary	4					4					
German measles	364			67		29	175	1	10	41	41
Influenza	4,770	219		2,407	26		530	98	337		1,153
Measles	1,673	4		84	2	279	1,165	58	21	28	32
Meningitis, meningo-coccal	12				4	1	7				
Mumps	1,041	3		12	3	216	381	50	87	114	175
Poliomyelitis	1				1						
Scarlet fever	269			3		67	53	29	19	36	62
Tuberculosis (all forms)	208	4		3	6	75	37	24	12	3	44
Typhoid and paraty-phoid fever	7					2				1	4
Veneral diseases:											
Gonorrhea	284	8		9	3	106	35	23	13	30	57
Syphilis	124	7		7	1	61	18	4	12	6	8
Primary	8			1		4	1			2	
Secondary	6					4					
Other	110	7		6	1	53	15	4	12	4	8
Whooping cough	126	1		1	1	38	57	10	3	1	14

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

The following reports include only items of unusual incidence or special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. 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.

Cholera

Burma. During the week ended March 17, 1951, 24 cases of cholera were reported in Moulmein as compared with 6 for the previous week.

Plague

India. For the week ended March 17, 1951, two imported cases of plague were reported in Allahabad and one in Bombay. During the week ended March 10, 1951, three and seven cases were reported in Lucknow and Nagpur, respectively.

Smallpox

Belgian Congo. During the week ended March 3, 1951, 39 cases of smallpox were reported in Belgian Congo.

Dahomey. During the period March 1-10, 1951, 35 cases of smallpox were reported in Dahomey.

India. The smallpox epidemic continues to increase in Bombay where 115 cases were reported for the week ended March 17, 1951, compared with 103 cases for the previous week. Other parts of India reporting large numbers of smallpox cases for the week ended March 17, 1951, were as follows: Calcutta 571, Cocanada 21, Masulipatnam 12, Allahabad 11, and Visakhapatnam 10.

India (French). For the week ended March 10, 1951, 219 cases of smallpox were reported in Pondicherry as compared with 149 for the previous week. There were 215 cases reported in the city for the week ended February 24.

Yellow Fever

Brazil. During the recent outbreak of jungle yellow fever in Brazil deaths have been confirmed in counties of Goiaz State as follows: Jaragua, December 22, 1950, one; Goiaz, January 13-February 9, 1951, three; Niquelandia, January 14-16, 1951, three; Uruacu, January 13-14, two; Porangatu, January 17, one; and Goiania, February 9, one. In Mato Grosso State, Guiratinga County, two confirmed deaths were reported for the period January 23-29, 1951.