Public Health Reports

Vol. 61 • DECEMBER 13, 1946 • *No. 50*

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

A SKIN REACTION IN RABBITS PRODUCED BY INTRADERMAL INOCULATION OF SUSPENSIONS OF KILLED *PASTEURELLA TULARENSIS* [1]

By CARL L. LARSON, *Surgeon, United States Public Health Service*

During the course of investigations concerning the immunity of various hosts against *Pasteurella tularensis*, skin tests were performed in rabbits utilizing antigens prepared from formalin-killed organisms. The aqueous phase, harvested after ether extraction of these crude suspensions, was also employed. Reactions occurring in rabbits, following intradermal injection of killed suspensions of *P. tularensis*, are described in this paper. The removal of a toxic principle from such suspensions by extraction with ether, and the neutralization of the skin reaction by immune serum is also discussed.

Giroud (*1*) demonstrated that rabbits reacted to intradermal injection of live typhus virus with production of a characteristic lesion, and that specific immune serum neutralized the ability of suspensions of rickettsiae to produce such lesions. Clavero and Gallardo (*2*), working with similar material, likewise concluded that the skin reaction was characteristic and that the serum-protection test was specific. The results obtained from the above studies indicate that a similar test may be of value in studying tularemia, a disease in which it has been extremely difficult to demonstrate protective antibodies in the serum of recovered individuals.

MATERIALS AND METHODS

Fully virulent strains of *P. tularensis*, with the exception of strain No. 38 which was avirulent, were employed throughout the course of these experiments. They were grown upon the yolk sac of developing

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

chick embryos, employing the method of Cox, or upon glucose cystine blood agar. Infected yolk sacs were made into 10-percent suspensions in 0.85-percent salt solution, injected into mice intraperitoneally in serial tenfold dilutions to determine the infective titer, and killed by the addition of a 0.1-percent concentration of formalin.

Organisms grown on solid media were suspended in 0.85-percent salt solution or in 10-percent suspensions of normal yolk sacs in saline. The infective titer of the bacterial suspension was determined by intraperitoneal injection of serial dilutions into mice. The organisms in suspension were subsequently killed with 0.1-percent formalin. Ether extraction was carried out according to the method of Topping and Shear (*3*) after the pH of the bacterial suspensions was adjusted to 5.6.

Serums from human cases of tularemia and serums from rabbits and goats immunized with suspensions containing killed *P. tularensis* were employed. These contained agglutinins against *P. tularensis*. Control serums consisted of normal rabbit or human serum.

All animals were obtained from stock of the colony maintained at the National Institute of Health.

The antigens which are discussed in this paper are listed in table 1, which also presents certain other pertinent data. Antigen 2367 was derived from antigen 2366 by extracting the latter with ether and harvesting the resultant aqueous phase. Similarly, antigens 2371, 2377, and 2381 were derived from antigens 2370, 2376, and 2380, respectively.

TABLE 1.—*Strains and preparations of* Pasteurella tularensis *employed*

Antigen	Strain of organism	Virulence of organism	Culture medium	Suspension fluid	Extracted with ether	LD_{50} (mouse)
HS	HS	Virulent	G.c.b.a.[1]	Saline	No	1.4×10^{-10}
SA	SA	do	do	do	No	3.2×10^{-10}
TV1	HS	do	do	do	No	1.5×10^{-10}
TV2	SA	do	do	do	No	6.8×10^{-9}
TV5	RHP	do	do	do	No	3.2×10^{-10}
2366	RHP	do	Yolk sac		No	3.2×10^{-9}
2367	RHP	do	do		Yes	
2370	RHP	do	G.c.b.a.[1]	Yolk sac	No	1×10^{-10}
2371	RHP	do	do	do	Yes	
2376	RHP	do	do	Saline	No	1×10^{-10}
2377	RHP	do	do	do	Yes	
2380	38	Avirulent	do	Yolk sac	No	
2381	38	do	do	do	Yes	
2398	RHP	Virulent	do	Saline	No	1.5×10^{-9}
2402	RHP	do	Yolk sac		No	5.2×10^{-10}
2406	SA	do	G.c.b.a.[1]	Yolk sac	No	4.2×10^{-9}
2410	SA	do	Yolk sac		No	6.8×10^{-9}
TV17	RHP	do	G.c.b.a.[1]	Saline	No	3.2×10^{-9}
TV17 EE	RHP	do	do	do	Yes	

[1] Glucose cystine blood agar.

EXPERIMENTAL PROCEDURE AND RESULTS

Description of the lesions.—The lesions produced in rabbits by intradermal introduction of suspensions of formalin-killed *P. tularensis* varied to some extent depending upon the amount administered. With properly adjusted inocula, a constant type of lesion was produced which persisted for from 10 days to 2 weeks. No signs were noted at the sites of injection 8 hours after introduction of specific preparations, but definite redness and swelling were apparent within 18 to 24 hours. The height of the reaction was attained in 48 to 72 hours, and at this time the lesions were about 15–25 mm. in diameter and about 4–8 mm. in height (fig. 1). They closely resembled the primary lesion described in infectious myxomatosis of rabbits. The edges were sharp. In some instances, however, spreading was observed from the dependent edges of lesions located on the side of the test animal. The lesions were firm and appeared to be very edematous. Varying degrees of redness were apparent. In many instances central areas of necrosis were observed. The lesions began to fade slowly and by the end of the fifth day they were fairly dry. Pigmentation and scaling developed and persisted for a number of days.

Lesions identical with those in rabbits were also produced in guinea pigs by intradermal injections of the specific antigen. The skin of guinea pigs is thick and fibrous, and consequently it is difficult to perform intradermal inoculations. Rabbits were therefore routinely employed because of the ease with which the skin may be manipulated.

Heat stability.—Suspensions HS, 2402 SA, and 2410 were tested to determine the heat stability of the fraction capable of producing skin lesions in rabbits. Two cubic centimeters of each suspension was heated at 56° C. for 30 minutes in a water bath or submerged in a boiling water bath for a similar period in sealed ampoules. The unheated, heated (56° C.), and boiled suspensions were then injected intradermally into each of four rabbits, using 0.25 cubic centimeters of inocula. The boiled yolk-sac suspensions were coagulated, but by repeated aspiration into a syringe, to which a 24-gauge needle was attached, the particles of coagulated material were broken up. The lesion produced by intradermal injection of antigen heated to 56° C. did not differ from that produced by unheated antigen. In each instance, boiled antigen failed to produce a reaction when injected intradermally into rabbits (table 2).

Sedimentation.—Five cubic centimeters each of suspensions 2410 and HS was centrifuged for 30 minutes at 4,000 r. p. m. The supernatant fluid was carefully pipetted from the sediment and retained for subsequent testing. The remaining fluid was drained of the sediment by inverting the centrifuge tube, placing the open end on

absorbent paper, and allowing it to drain for 15 minutes. The sediment was then resuspended to the original volume in salt solution

TABLE 2.—*Cutaneous lesions produced in rabbits by intracutaneous injection of 0.25 cc. of unheated, heated (56° C.), and boiled suspensions containing formalin-killed* Pasteurella tularensis

Treatment of antigen	Dimensions of lesions and degree of edema							
	Antigen 2410		Antigen 2402		Antigen SA		Antigen HS	
	Dimension	*Edema*	*Dimension*	*Edema*	*Dimension*	*Edema*	*Dimension*	*Edema*
None	26×20 mm.	3+	20×19 mm.	3+	30×20 mm.	2+	28×15 mm.	1+
Heated (56°C.)	32×20 mm.	3+	26×22 mm.	2+	28×22 mm.	2+	26×23 mm.	1+
Boiled	I.B.[1]	-----	I.B.[1]	-----	Negative	-----	Negative	-----

[1] Residual lesion due to yolk sac.

containing 0.1-percent formalin. Rabbits were inoculated intracutaneously with 0.2-cc. amounts of the original suspension, supernatant fluid, and resuspended sediment. The supernatant fluids in general failed to produce lesions, whereas the sediments and the original suspensions produced typical reactions (table 3). The fraction responsible for production of skin lesions appears to be intimately associated with the bacteria.

TABLE 3.—*Cutaneous lesions produced in rabbits by intracutaneous injection of 0.2 cc. of whole suspension and of the supernatant and sediment obtained by centrifugation of suspensions containing formalin-killed* Pasteurella tularensis

Antigen	Centrifuged	Type of preparation	Dimensions of lesions and degree of edema			
			Rabbit 104		Rabbit 105	
			Dimension	*Edema*	*Dimension*	*Edema*
2410	No	Whole suspension	35×17 mm.	2+	23×22 mm.	2+
Do	Yes	Sediment	25×23 mm.	2+	20×18 mm.	2+
Do	Yes	Supernatant	Negative	-----	15×12 mm.	0
HS	No	Whole suspension	12×12 mm.	1+	11×10 mm.	1+
Do	Yes	Sediment	12×10 mm.	1+	12×10 mm.	1+
Do	Yes	Supernatant	Negative	-----	Negative	-----

Titration.—Attempts were made to determine the minimal effective dose of the substance responsible for the dermal reaction, using the following suspensions: 2366, 2370, 2376, 2380, 2406, 2410, 2398, 2402, and HS.

In one experiment, lots HS and 2410 were injected in 0.25-cc. amounts into the skin of each of two rabbits, using fourfold dilutions in an 0.85-percent salt solution. The results are given in table 4. The titers for these two antigens are in the neighborhood of 1:64 to 1:256. The end point of dermal activity is, in some measure, determined by the sensitivity of the test animal.

In a similar experiment in which nine other antigens containing suspensions of formalized *P. tularensis* were tested, the results obtained

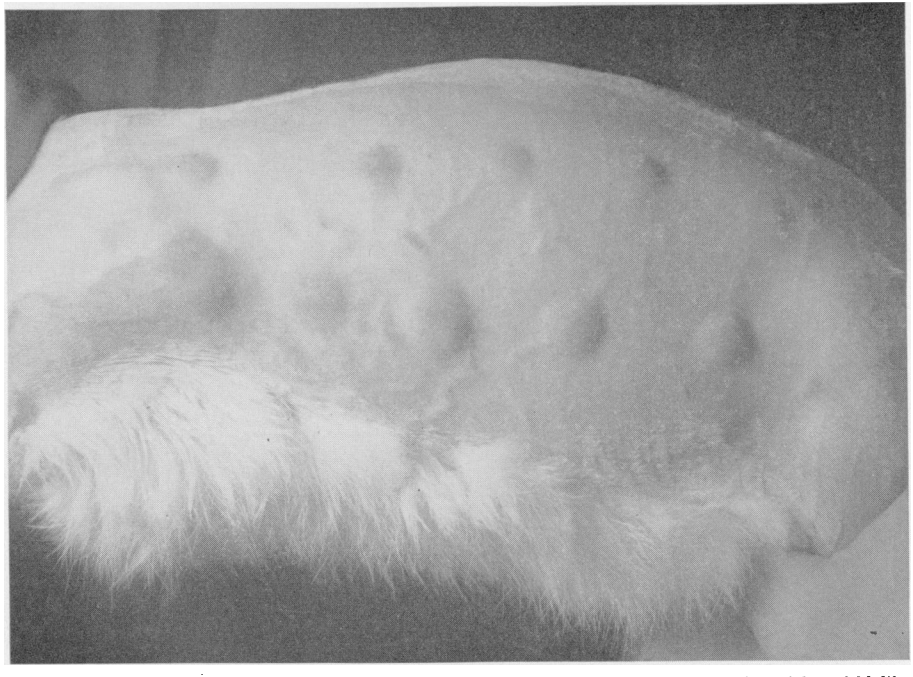

FIGURE 1.—Skin lesions in a rabbit inoculated intracutaneously with 0.2 cc. of antigen TV17 in serial twofold dilutions. Lower left, undiluted antigen; upper right, antigen diluted 1:512 in salt solution.

showed that two antigens had titers of 1:8; two had titers of 1:16; four had titers of 1:32 or above; and one had a titer of 1:512 or greater.

Ether extraction.—The effect of extracting bacterial suspensions with ether was tested. A portion of a 10-percent suspension of yolk sacs infected with virulent *P. tularensis* and suspended in saline, preparation 2366, was extracted with ether and the aqueous phase, preparation 2367, was obtained. A portion of the aqueous phase was centrifuged for 30 minutes at 4,000 r. p. m. in an angle centrifuge and the supernatant fluid, preparation 2367T, was retained. A preparation consisting of a 10-percent suspension of normal yolk sacs in saline, preparation 14, was extracted with ether and the aqueous phase, preparation 14E harvested.

TABLE 4.—*Cutaneous lesions produced in rabbits by intradermal injection of 0.25 cc. of fourfold dilutions of suspensions containing formalin-killed* Pasteurella tularensis

Antigen	Dilution	Dimensions of lesions and amount of edema			
		Rabbit 106		Rabbit 107	
		Dimension	*Edema*	*Dimension*	*Edema*
2410	Undiluted	20×18 mm.	3+	30×30 mm.	3+
	1:4	20×17 mm.	3+	22×17 mm.	2+
	1:16	20×15 mm.	2+	10×10 mm.	1+
	1:64	15×15 mm.	1+	10×10 mm.	1+
	1:256	15×15 mm.	0	Negative.	------
	1:1024	Negative	------	Negative.	------
HS	Undiluted	19×16 mm.	2+	20×16 mm.	1+
	1:4	20×15 mm.	2+	20×16 mm.	1+
	1:16	20×18 mm.	2+	15×15 mm.	1+
	1:64	20×18 mm.	2+	10×10 mm.	1+
	1:256	18×18 mm.	1+	Negative.	------
	1:1024	Negative	------	Negative.	------

Sufficient organisms grown on solid media were added to various lots of preparation 14 so that the resultant suspensions contained approximately the same number of organisms as the infected yolk-sac suspension, preparation 2366. An avirulent strain of *P. tularensis*, strain No. 38, was added to the normal yolk-sac suspension and this was designated as lot 2380. A fully virulent strain of *P. tularensis* was added to the normal yolk-sac suspension to make lot 2370. The aqueous phase after ether extraction of lots 2370 and 2380 were designated as lots 2371 and 2381, respectively. A suspension of the virulent strain of organism in saline, which contained the same number of organisms as lot 2370, was prepared and designated as lot 2376. The aqueous phase after extraction was labeled as lot 2377.

All the above preparations were injected intracutaneously into two rabbits, each preparation in 0.2-cc. amounts and in duplicate. The results obtained are shown in table 5. Normal yolk sacs suspended in 0.85-percent salt solution failed to produce skin lesions in rabbits. Suspensions of infected yolk sacs and suspensions of normal yolk

sacs to which virulent or avirulent organisms had been added elicited reactions. Organisms grown on solid media and suspended in saline also produced lesions. Ether extraction of any of the above preparations destroyed their ability to produce such lesions.

TABLE 5.—*Cutaneous lesions produced in rabbits by intradermal injection of 0.2 cc. of ether-extracted and non-ether-extracted suspensions containing formalin-killed* Pasteurella tularensis

Antigen	Extracted with ether	Culture medium	Suspension fluid	Organisms present	Virulence of organisms	Dimensions of lesions and degree of edema			
						Rabbit 108		Rabbit 109	
						Dimension	*Edema*	*Dimension*	*Edema*
14	No		N. Y. S.[1]	0		2 x 2 mm.	0	Negative	---
14E	Yes		do	0		Negative	---	Negative	---
2366	No	Yolk sac		+	Virulent	30 x 17 mm.	4+	27 x 16 mm.	4+
2369	Yes	do		+	do	Slight flush	---	Slight flush	---
2370	No	G. c. b. a.[2]	N. Y. S.	+	do	25 x 21 mm.	4+	25 x 21 mm.	4+
2371	Yes	do	do	+	do	Slight flush	---	Slight flush	---
2376	No	do	Saline	+	do	21 x 20 mm.	3+	16 x 14 mm.	3+
2377	Yes	do	do	+	do	Negative	---	Negative	---
2380	No	do	N. Y. S.	+	Avirulent	12 x 10 mm.	2+	17 x 17 mm.	2+
2381	Yes	do	do	+	do	Slight flush	---	Slight flush	---

[1] Ten-percent suspension of normal yolk sacs in 0.85-percent salt solution.
[2] Glucose cystine blood agar.

We have been unable to demonstrate the presence of the toxic fraction in any of the phases resulting from ether extraction of yolk-sac or saline suspensions of organisms, although minimal lesions similar to those observed following intradermal injection of foreign materials occasionally occurred.

Effect of immunization of rabbits upon skin reactions.—A number of experiments was performed to determine the effect of immunization of rabbits upon the skin lesions produced by subsequent intradermal inoculation of specific formalized antigens. The effect was obscured in those experiments in which yolk-sac preparations were employed, since the animals became sensitized to egg materials. Antigens derived from cultures of *P. tularensis* grown on glucose cystine blood agar, killed with formaldehyde, and suspended in salt solution were then employed as the immunizing agent and as the skin-test factor. Antigens TV17 and TV17 EE were employed to immunize two rabbits. The rabbits were given 0.5, 1.0, and 2.0 cc. of each antigen intravenously on three consecutive days. One week after the last injection of antigen, these animals, together with two control rabbits, were inoculated intracutaneously with 0.2 cc. of 1:10 dilutions of antigens TV17 and TV17 EE. The results are shown in table 6. The lesions produced by antigen TV17 were smaller in the immunized animals than in the controls. No effect was demonstrated in the case of antigen TV17 EE, which produced minimal lesions in all animals, except for one control which developed no lesion. It would appear that immunization with the crude vaccine tends to decrease the size

of the skin lesion, but some sensitivity to subsequent intradermal injection of crude and ether-extracted antigens is maintained.

TABLE 6.—*Cutaneous lesions in normal rabbits and in rabbits immunized with crude and ether-extracted vaccines containing formalin-killed* Pasteurella tularensis *given intravenously in 0.5-, 1.0-, and 2.0-cc. amounts on three consecutive days*

Rabbit	Immunized	Antigens employed	Dimensions of subcutaneous lesions and degree of edema			
			TV17		TV17EE	
			Dimension	*Edema*	*Dimension*	*Edema*
A	No		24 x 20 mm.	2+	Negative.	
B	No		21×19 mm.	2+	6×5 mm.	hard nodule.
C	Yes	TV17	12×12 mm.	2+	9×6 mm.	hard nodule.
D	Yes	TV17	14×10 mm.	2+	5×5 mm.	hard nodule.
E	Yes	TV17 EE	12× 9 mm.	2+	10×9 mm.	1+edema.
F	Yes	TV17 EE	12× 9 mm.	1+	5×5 mm.	hard nodule.

Effect of immune serum upon skin reactions.—A number of immune serums were tested to determine their effect on the ability of antigens to produce skin lesions in rabbits when the antigen and antiserum were mixed and incubated prior to injection into rabbits. Serial dilutions of serum and suspensions of killed organisms were made in distilled water. Equal quantities of diluted serum and of the suspension of organisms were mixed and incubated at room temperature for 1 hour. The mixtures were injected intracutaneously into rabbits. Inocula of 0.2-cc. or 0.25-cc. amounts were employed. Each serum-antigen mixture was injected into each of two rabbits, which were also inoculated with a control mixture containing normal serum and antigen.

The results obtained are demonstrated in the following test with antigen TV5a. This antigen contained *P. tularensis* grown on glucose cystine agar. The organisms were suspended in saline and killed with 0.1-percent formalin. The serums employed were normal human serum, NHS; serum 28978, with an agglutination titer of 1:2560 against *P. tularensis,* obtained from a case of tularemia of recent origin; and serum V25, with an agglutination titer of 1:80 against *P. tularensis,* obtained from an individual presenting no history of tularemia but having a positive skin reaction to Foshay's skin-test antigen. The antigen was diluted 1:3 in distilled water and added to equal quantities of whole serum and to serial tenfold dilutions of serum in distilled water (1:5 to 1:5,000). Thus, antigen diluted 1:6 and serum diluted 1:2, 1:10, 1:100, 1:1,000, and 1:10,000 were present in the final mixtures. After incubation at room temperature for 1 hour, 0.2 cc. of each mixture was injected intracutaneously into each of two rabbits. The lesions observed were recorded at the end of 48 and 72 hours. The results are shown in table 7. The immune

serums definitely inhibited the production of skin lesions. The end point was not reached with serum 28978, and a definite inhibition was shown with serum V25 at a 1:10 dilution.

TABLE 7.—*The neutralization (by specific immune serum) of the ability of suspensions containing formalin-killed* Pasteurella tularensis *to produce cutaneous lesions in rabbits*

Serum	Agglutination titer against *P. tularensis*	Dimensions of lesions, degree of edema and dilutions of serums employed				
		1:2	1:10	1:100	1:1000	1:10000
		Rabbit 136				
NHS	Negative	22×20 mm. 2+edema	21×19 mm. 2+edema	24×17 mm. 2+edema	26×18 mm. 2+edema	25×18 mm. 2+edema
28978	1:2560	Negative	Negative	Negative	Negative	Negative
V25	1:80	Negative	Negative	21×17 mm. 1+edema	24×19 mm. 2+edema	24×15 mm. 2+edema
		Rabbit 137				
NHS	Negative	29×21 mm. 4+edema	22×20 mm. 4+edema	22×15 mm. 4+edema	23×17 mm. 4+edema	26×19 mm. 4+edema
28978	1:2560	Negative	Negative	Negative	Negative	Negative
V25	1:80	Negative	Negative	19×11 mm. 1+edema	26×18 mm. 3+edema	24×22 mm. 4+edema

Further tests were made employing other serums. The results are tabulated in table 8. Inhibition of the skin reaction was observed with all serums obtained from cases which, by clinical and laboratory evidence, were cases of tularemia, and with serums from a human and a rabbit immunized against tularemia. No inhibition was apparent when normal rabbit serum or serum from cases of undulant fever was employed. There appears to be a general tendency for serums possessing the ability to inhibit skin lesions to possess also a high agglutina-

TABLE 8.—*The agglutination titers against* Pasteurella tularensis *and* Brucella abortus *and the neutralization titer against the capacity of suspensions containing formalin-killed* Pasteurella tularensis *to produce skin lesions in rabbits*

Serum	Source of serum	Agglutination titer versus		Neutralization titer	Remarks
		P. tularensis	*Br. abortus*		
7	Human	Negative	1:2560	Negative	Brucellosis.
76	do	do	1:320	do	Do.
73	do	1:320	Negative	1:2	Tularemia.
74	do	1:320	do	1:10	Do.
V25	do	1:80	do	1:10	Tularemia (remote).
HD	do	1:160	do	1:100	Vaccinated versus tularemia.
R2	Rabbit	1:320	1:10	1:100	Do.
BG	Human	1:1280	1:10	1:100	Tularemia.
71	do	1:1280	1:10	1:100	Do.
EV	do	1:1280	Negative	1:100	Do.
28109	do	1:1280	do	1:100	Do.
28972	do	1:10240	1:20	1:1000	Do.
G11	do	1:1280	Negative	1:10000	Do.
28978	do	1:2560	1:160	1:10000	Do.
28132	do	1:5120	Negative	1:10000	Do.

tion titer. This is not always the case, for some serums with low inhibiting power, e. g., serum 74, possess high agglutination titers and in some instances, e. g., serum 28972, the inhibiting power is lower than the agglutination titer. Studies are being made to determine the relation between the ability of serums to agglutinate *P. tularensis*, to inhibit the production of skin lesions in rabbits by specific antigens, and to protect rats against infection with *P. tularensis*.

DISCUSSION

The reaction described demonstrates the toxicity of formalized preparations of *P. tularensis* for the skin of rabbits. The degree of dermal reaction in normal rabbits is intense and closely resembles that which we have observed during the first 48 hours following the injection of living organisms into the skin of normal rabbits.

It had been previously demonstrated that ether-extracted vaccines are, to some degree, more antigenic than vaccines which are not treated in this manner (*4*). The results obtained in the present study show that ether extraction decreases the toxic effects of *P. tularensis* antigens as demonstrated by the reduction of the skin reaction in rabbits following intradermal injection of such antigens. These findings indicate that such vaccines should be extracted with ether before being used as immunizing agents.

The ability of specific immune serums to neutralize the skin-toxic factor demonstrates that such serums possess antibodies, developed during the course of immunization or infection, capable of neutralizing at least some portion of the antigenic complex of *P. tularensis*. Whether or not this capacity of immune serum is related to the protective ability of the serum is not as yet clear.

SUMMARY

Suspensions of *P. tularensis* grown on glucose cystine blood agar, suspended in 0.85-percent salt solution or 10-percent normal yolk-sac suspension, and killed with 0.1-percent formalin are capable of producing lesions when injected intracutaneously into normal rabbits.

Suspensions of *P. tularensis* grown on the yolk sacs of chick embryos, suspended in salt solution and killed with 0.1-percent formalin are capable of producing skin lesions in normal rabbits.

Skin lesions may be produced in normal rabbits either by fully virulent or avirulent strains of *P. tularensis*.

The skin-toxic fraction is not destroyed by heating at 56° C. for 30 minutes, but is destroyed by boiling for a similar period.

Ether extraction of antigens wholly or partially destroys the capacity of the toxic factor to produce skin lesions in normal rabbits.

Specific immune serum neutralizes the skin-toxic factor contained in formalized antigens.

Rabbits immunized with crude antigens containing killed *P. tularensis* apparently are capable of partially neutralizing the skin-toxic factor.

REFERENCES

(*1*) Giroud, P.: Essai de mise en évidence des anticorps du typhus exanthématique par un test cutané. Compt. rend. Soc. de biol., **127**: 397–399 (1938).
(*2*) Clavero, G. and Gallardo, F. Pérez: Giroud's intradermic test in typhus fever infection. Bull. Health Organization League of Nations. **10**: 700–721 (1943–44).
(*3*) Topping, N. H. and Shear, M. J.: Studies of antigens in infected yolk sacs. Pub. Health Rep. **59**: 1671–1675 (Dec. 29, 1944).
(*4*) Larson, C. L.: Immunization of white rats against infections with *Pasteurella tularensis*. Pub. Health Rep. **60**: 725–734 (June 29, 1945).

DURATION OF TOXICITY OF SEVERAL DDT RESIDUAL SPRAYS UNDER CONDITIONS OF MALARIA-CONTROL OPERATIONS [1]

By FREDERICK L. KNOWLES, *Senior Biophysicist* and CLINTON S. SMITH, *Biological Aide, United States Public Health Service*

This study is concerned with the duration of toxicity of several DDT residual sprays, in relation to the length of the "malaria season," and under conditions of malaria-control operations. That a DDT residual spray applied to the inside walls and ceilings of houses is effective in killing *Anopheles quadrimaculatus* females resting in houses has been demonstrated by Knowles and Smith (*1*) and by others. Although Knowles and Smith showed that a DDT residual spray was effective up to the end of their study, a period of approximately 3 months, the limit of the duration of toxicity in relation to the "malaria season" and under conditions of malaria-control operations has not been clearly established. This information is of primary importance in planning and organizing a spraying program and in computing its total cost, because this information determines whether houses should be sprayed once, twice, or more often during the "malaria season."

For the purposes of this study, an area some 7 square miles in extent near the town of Hughes, Ark. was selected because it was typical of the Delta region, traditionally devoted to the culture of cotton, and because of the relatively large adult mosquito population. The area contained 115 houses, of which 18 were vacant and 97 were occupied by 90 white and 330 Negro men, women, and children. The houses were, in general, the conventional plantation type with little or no screening, and were of such construction and in such condi-

[1] From the National Institute of Health, Office of Malaria Investigations, Memphis, Tenn.

tion that screening alone would not have been a serious impediment to the access of mosquitoes.

Each occupied house was assigned a number. The numbers, divided into five groups, were marked on cards and placed in a container and thoroughly mixed. Cards were drawn from the container and the corresponding numbers on the card assigned to each house in the order in which they occurred, following the roads in a prescribed route.

For purposes of comparison, one group of houses was left unsprayed or was sprayed with a xylol-triton mixture to appease insistent demands. The four other groups were sprayed with four different formulations of DDT.

A 4-gallon open-head compressed-air sprayer fitted with 3 feet of xylol-resistant hose, a shut-off valve, spray wand, and a special nozzle was used for applying the spray. Specifications for this nozzle state that it shall give a flat 80-degree atomized spray with a delivery rate of 0.2 gallon per minute at a pressure of 40 pounds. For applying formula C, a nozzle giving a flat 50-degree atomized spray at the rate of 0.4 gallon per minute at a pressure of 40 pounds was used. The spraying was done by an experienced operator.

The four different formulas of DDT are tabulated in table 1, water having been added so that the applied spray contained approximately 5 percent DDT. Table 2 shows the number of houses in each group, the total wall and ceiling area sprayed, as well as the average per house, and the calculated deposition of DDT in milligrams per square foot.

TABLE 1.—*Ingredients and proportions of the four different formulas of DDT employed*

Ingredients	Formula A	Formula B	Formula C	Formula D
DDT	1 part	1 part	3.5 lb	1 part.
Xylol	3 parts	3 parts	10.5 lb	
Triton X100	0.25 part	0.25 part	0.9 lb	0.5 part.
Carbowax 400 [1]		0.35 part		
Paint			20 gal	
PD544C [2]				4 parts.
Water	17 parts	18 parts		16.5 parts.

[1] Produced by Union Carbon & Carbide.
[2] Produced by Socony Oil Co.

The walls and ceilings of 72 houses were sprayed during the period May 21 to June 6, when the first *A. quadrimaculatus* adults could be found in their usual daytime resting places. It is at this time that malaria transmission begins, and this period is therefore the beginning of what is called the "malaria season."

Inspections were made not only of the inside of sprayed and unsprayed houses but also under houses and in all outbuildings, in order

to indicate the extent of the mosquito population on the premises. Two inspectors, equipped with 5-cell focusing flashlights were employed. One inspector examined the inside of the house and under the house; the other, the outbuildings. No inspections were made before 10 a. m.

TABLE 2.—*Comparison of the five groups of houses*

Item	Formula				
	Unsprayed	A	B	C	D
Number of houses	25	22	20	10	20
Total area sprayed		45,170	41,845	16,420	43,465
Average square feet per house		2,053	2,092	1,642	2,173
Milligrams DDT per square foot	None	90.4	86.8	96.7	94.0

The first inspection was made approximately 4 weeks after spraying, the inspection period being from June 20 to July 3. Six complete inspections were made of practically all the houses in the five groups approximately 4, 6, 9, 12, 14, and 17 weeks, respectively, after spraying. At the time of the last inspection, September 19 to October 12, the weather had become cooler, and relatively few *A. quadrimaculatus* adults were found.

The results of the six inspections are tabulated in table 3, which gives for each inspection period and for each group of houses the actual number of mosquitoes found and the mean number of mosquitos per house.

The data has been arranged in table 4 to show the number of houses in both the unsprayed group and the combined sprayed groups which harbored 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 or more mosquitoes when inspected. Chi-square values calculated for each of the six inspection periods are 62.76, 58.71, 38.88, 44.40, 22.38, and 29.56, respectively. These values indicate a probability of less than 1 in 100 and are considered highly significant.

Also, comparison of each sprayed group with the unsprayed group for each inspection was made, and chi-square values were calculated. All four groups for the first four inspections gave chi-square values that indicated a probability of less than 1 in 100, except group C, which had a probability of about 2 in 100. Groups A, B, and D for the fifth and sixth inspections gave chi-square values for a probability of more than 1 in 100, but less than 5 in 100. Group C for the fifth inspection gave a probability of about 25 in 100, and for the sixth inspection, a probability of less than 10 in 100, but more than 5 in 100. All values, except for group C for the fifth and sixth inspections, may be considered statistically significant.

TABLE 3.—*Comparison of the mean number of resting* Anopheles quadrimaculatus *females found in the 5 groups of houses for the 6 inspection periods*

Inspection-period dates, 1945	Average time in weeks since spraying	Unsprayed	Sprayed with formula indicated			
			A	B	C	D
MEAN NUMBER OF MOSQUITOES PER HOUSE						
June 21 to July 6	4	6.2	0.30	0.05	0.11	0.12
July 6 to July 20	6	7.4	0	.10	0	.05
July 26 to Aug. 10	9	5.3	.11	.20	.10	.20
Aug. 13 to Aug. 28	12	4.0	.17	.05	.10	.10
Aug. 28 to Sept. 18	14	3.4	.11	0	.11	.06
Sept. 19 to Oct. 12	17	1.6	0	0	0	0
ACTUAL NUMBER OF MOSQUITOES FOUND						
June 21 to July 6	4	123	6	1	1	2
July 6 to July 20	6	177	0	2	0	1
July 26 to Aug. 10	9	133	2	4	1	4
Aug. 13 to Aug. 28	12	91	3	1	1	2
Aug. 28 to Sept. 18	14	65	2	0	1	1
Sept. 19 to Oct. 12	17	33	0	0	0	0
NUMBER OF HOUSES INSPECTED						
June 21 to July 6	4	20	20	20	9	17
July 6 to July 20	6	24	20	20	10	20
July 26 to Aug. 10	9	25	18	20	10	20
Aug. 13 to Aug. 28	12	23	18	19	10	19
Aug. 28 to Sept. 18	14	19	18	17	9	17
Sept. 19 to Oct. 12	17	21	22	19	10	20

TABLE 4.—*Distribution of houses according to the number of resting* Anopheles quadrimaculatus *females found in each house at each of the 6 inspections*

Number of mosquitoes in house	Number of houses											
	First inspection, June 21 to July 6		Second inspection, July 6 to July 20		Third inspection, July 26 to Aug. 10		Fourth inspection, Aug. 13 to Aug. 28		Fifth inspection, Aug. 28 to Sept. 18		Sixth inspection, Sept. 19 to Oct. 12	
	Unsprayed	Sprayed	Unsprayed	Sprayed	Unsprayed	Sprayed	Unsprayed	Sprayed	Unsprayed	Sprayed	Unsprayed	Sprayed
0	2	58	5	68	6	60	7	59	10	57	13	71
1	1	6	2	1	4	6	4	7	4	4	6	0
2	4	2	1	1	3	1	4	0	2	0	0	0
3	4	0	2	0	1	1	2	0	0	0	0	0
4	2	0	3	0	3	0	2	0	0	0	0	0
5	1	0	2	0	1	0	1	0	1	0	0	0
6	0	0	1	0	1	0	0	0	0	0	0	0
7	2	0	3	0	0	0	0	0	0	0	0	0
8	0	0	1	0	1	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10 or over	4	0	4	0	5	0	3	0	2	0	2	0
Total number of houses	20	66	24	70	25	68	23	66	19	61	21	71

SUMMARY AND CONCLUSIONS

To determine the duration of toxicity for mosquitoes of several DDT residual sprays, 72 houses were sprayed with 4 formulas of DDT spray at the beginning of the "malaria season," on about June 1, and were inspected at 6 different periods until October 1, 1945. Twenty-five unsprayed houses in the same area were inspected at the same time.

For the period of the "malaria season," in this region a period of 17 weeks, the once-sprayed houses harbored significantly fewer mosquitoes than the unsprayed houses.

Little difference was found in the duration of toxicity of the four formulas of DDT residual spray employed, except for the formula used in the houses in group C, which was statistically less effective 14 weeks after spraying.

ACKNOWLEDGMENTS

Acknowledgment is made to John E. Taylor, State Director, Malaria Control in War Areas, Little Rock, Ark.; Sanitary Engineer Director Mark D. Hollis, Officer in Charge, Malaria Control in War Areas, Atlanta, Ga.; and Senior Surgeon Victor H. Haas, Medical Officer in Charge, Malaria Investigations, Memphis, Tenn., for their interest and advice and the facilities afforded for pursuing the study. Also, acknowledgment is made to the Institute of Statistics of the University of North Carolina for its assistance in the statistical analysis of the data.

REFERENCES

(*1*) Knowles, F. L. and Smith, Clinton S.: DDT residual house spray—a method of malaria control in rural areas. Pub. Health Rep., **60**: 1274–1279 (1945).

POTASSIUM AND SODIUM METAPHOSPHATES AS SOURCES OF PHOSPHORUS FOR ANIMALS [1]

By H. F. Fraser, *Surgeon, United States Public Health Service*, E. R. Smith, *Tennessee Valley Authority*, and W. C. White, *Physicist, United States Public Health Service*

Wartime demands for a larger production of livestock and poultry in this country have materially increased the phosphate requirement for feeding purposes (*1*). It is known that natural phosphate rock can be made satisfactory for animal feeding by various processes of defluorination (*1*), (*2*), (*3*). A considerable number of phosphate products thus prepared, either experimentally in pilot plants or in large amounts by the chemical and fertilizer industries, were studied

[1] From the National Institute of Health, U. S. Public Health Service, and the Tennessee Valley Authority.

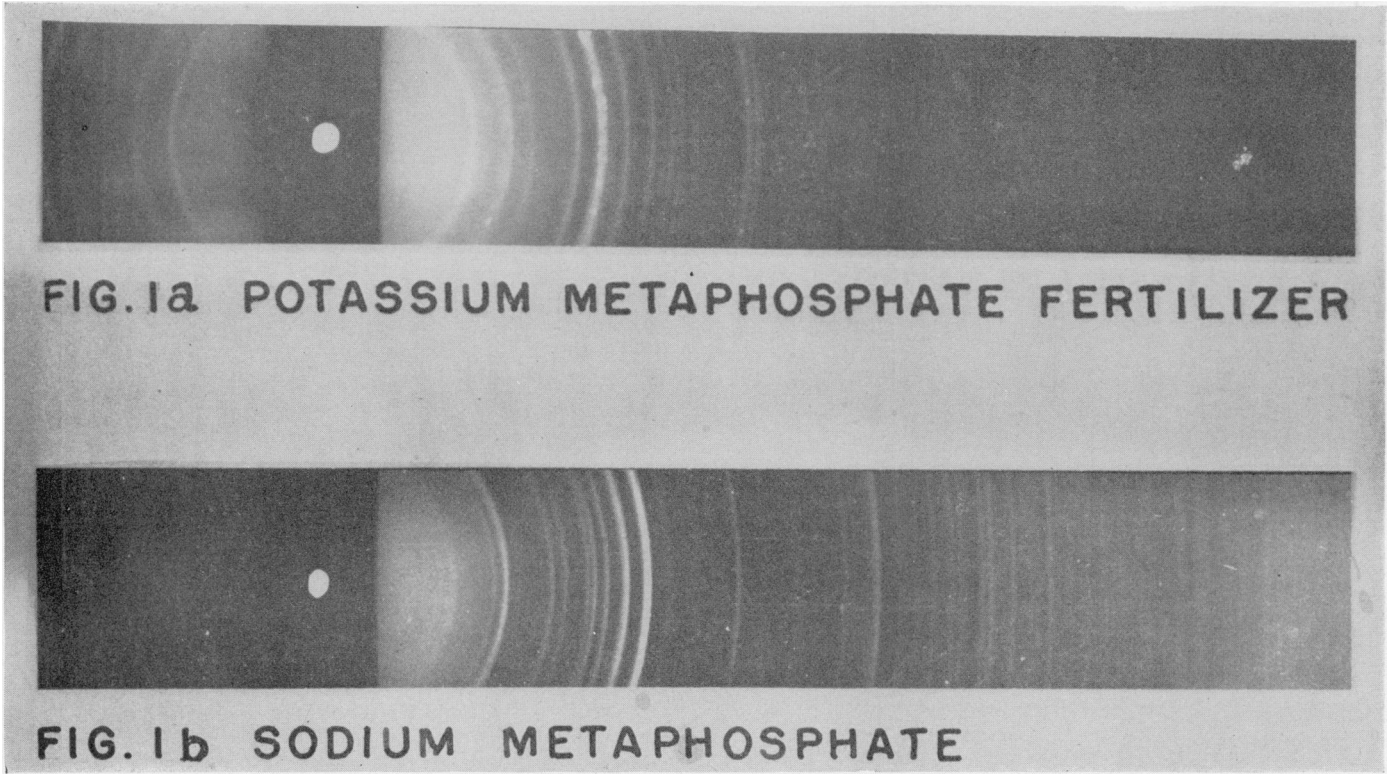
FIG. Ia POTASSIUM METAPHOSPHATE FERTILIZER
FIG. Ib SODIUM METAPHOSPHATE

FIGURE 1.

in respect to their composition and solubility by Hill, Reynolds, Hendricks, and Jacob (*3*). The availability, for the nutrition of the rat, of the calcium and phosphorus in these defluorinated phosphates has been the subject of several reports (*4*), (*5*), (*6*). The report by Ellis, Cabell, Elmslie, Fraps, Phillips, and Williams (*6*), represents a pooled experiment from several laboratories. Bird et al. (*7*) published in 1945 a resumé of studies of phosphorus supplements for feeding chickens.

The experiments reported in this paper were undertaken to investigate further the availability to rats of selected potassium and sodium metaphosphate compounds of a crystalline type which might serve as a source of phosphorus for domesticated animals. In addition, experiments were conducted to determine the effect of oxalate and ferric ion upon the absorption of calcium and phosphorus in the presence of meta- and ortho-phosphate.

MATERIALS AND METHODS

Plan of experiments and description of diets.—The general method was to compare the amount of storage of calcium and phosphorus in young, rapidly growing rats fed selected metaphosphates with the amount of storage of these elements in litter mates of the same sex given orthophosphates of known availability. The basal phosphorus-deficient diet of Schneider and Steenbock (*8*) with minor modifications (*4*) was used. The Wesson salt mixture was altered to produce the desired phosphorus content and adjusted so as not to distort the calcium-phosphorus ratio (*4*). The experimental procedures, description of diet preparation, and methods of chemical analysis are identical with those presented and described in detail in a previous report (*4*). The total percentage and source of phosphorus in the experimental diets are shown in table 1. The basal diet contained 0.01 percent calcium to which was added 0.2 percent

TABLE 1.—*Total percentage and source of phosphorus in experimental diets*

Dietary source of phosphorus	Experiment No.—										
	I			II		III		IV		V	
	Diet 563	Diet 564	Diet 565	Diet 566	Diet 567	Diet 568	Diet 569	Diet 570	Diet 571	Diet 572	Diet 573
Basal diet	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.4
KH_2PO_4	0.12	------	------	------	------	0.12	------	0.12	------	0.12	------
KPO_3 (fertilizer, crystalline)	------	0.12	------	------	------	------	------	------	------	------	------
KPO_3 (laboratory, crystalline)	------	------	0.12	------	------	------	------	------	------	------	------
$CaHPO_4$	------	------	------	0.12	------	------	------	------	------	------	------
$NaPO_3$ (Bakers, crystalline)	------	------	------	------	0.114	------	0.114	------	0.114	------	------
$NaPO_3$ (laboratory, amorphous)	------	------	------	------	------	------	------	------	------	------	0.12
Total	0.16	0.16	0.16	0.16	0.154	0.16	0.154	0.16	0.154	0.16	0.16

calcium as $CaCO_3$, with the exception that in diet 566 part of the calcium was derived from $CaHPO_4$.

Description of crystalline and amorphous metaphosphates used.— The crystalline potassium metaphosphate "fertilizer" used in experiment 1 was prepared by the Tennessee Valley Authority. It contained 26.6 percent K_2O and 55.6 percent P_2O_5; the remaining constituents were oxides of silica, iron, and aluminum. The X-ray diffraction pattern shown in figure 1a was identical with a crystalline sample prepared from chemically pure chemicals in our laboratory and with a sample prepared from technical grade primary potassium orthophosphate by the United States Department of Agriculture.[2] The chemically pure potassium metaphosphate was prepared in the laboratory from chemically pure potassium dihydrogen orthophosphate by fusion at 700° C. in a platinum dish; it was then cooled and the resulting crystalline compound was ground for animal tests. The X-ray powder diffraction data of this compound is presented in the conventional manner in table 2. The physical properties of pure crystalline potassium metaphosphate, identical in X-ray diffraction pattern with the "fertilizer" mentioned above, have been investigated by Madorsky and Clark (*9*). They found it to be extremely insoluble in water (0.0041 gm. per 100 ml. at 25° C. when the solubility was checked at successive intervals over a 24-hour period). They concluded that hydrolysis to ortho- or pyro-forms in water is exceedingly slow at this temperature.

TABLE 2.—*X-ray powder diffraction data of crystalline potassium metaphosphate*

d [1]	I/I_o [2]	d [1]	I/I_o [2]	d [1]	I/I_o [2]
6.3	0.46	2.07	0.05	1.476	0.05
5.22	0.27	2.04	0.04	1.445	0.19
5.04	0.35	2.02	0.15	1.423	0.10
4.52	0.15	1.973	0.06	1.40	0.08
3.73	0.50	1.944	0.33	1.38	0.13
3.45	1.00	1.890	0.10	1.340	0.07
3.38	0.46	1.864	0.13	1.31	0.12
3.29	0.15	1.833	0.08	1.281	0.09
3.14	0.50	1.807	0.08	1.264	0.20
3.07	0.15	1.786	0.15	1.215	0.06
2.90	0.35	1.760	0.04	1.198	0.07
2.83	0.19	1.730	0.15	1.170	0.15
2.74	0.27	1.710	0.06	1.157	0.13
2.67	0.32	1.682	0.04	1.140	0.15
2.57	0.32	1.661	0.05	1.129	0.15
2.38	0.04	1.63	0.07	1.116	0.15
2.33	0.08	1.61	0.08	1.103	0.15
2.26	0.71	1.57	0.20	1.085	0.08
2.21	0.58	1.495	0.06		

[1] d=interplanar spacing.
[2] I/I_o=relative intensity of lines.

[2] Supplied by K. G. Clark, Plant Industry Station, Beltsville, Md.

The chemical company from which crystalline sodium metaphosphate was obtained stated that the $NaPO_3$ was prepared by reacting NaH_2PO_4 with $Na_2CO_3.H_2O$ and H_3PO_4. An excess of H_3PO_4 will produce an equivalent amount of HPO_3, and a deficiency of H_3PO_4 will result in a corresponding increase in the amount of $Na_4P_2O_7$. The above mixture is concentrated by evaporation and then furnaced at 400° C. A chemical analysis of this compound showed it to contain 28.86 percent phosphorus as compared to a theoretical value for $NaPO_3$ of 30.38 percent. It is readily soluble in distilled water. The X-ray powder diffraction pattern showed the presence of $NaPO_3$, some $(NaPO_3)_3$, and another weak pattern which was not identified. (See fig. 1b.)

The amorphous $NaPO_3$ was prepared in the laboratory by fusing chemically pure $NaH_2PO_4 \cdot H_2O$ in a platinum dish at approximately 700° C; it was then cooled rapidly so as to produce an amorphous, homogenous, glassy material which was finely ground for animal and chemical tests. This compound is also known as Graham salt and sodium hexa- metaphosphate; it is readily soluble in water. Karbe and Jander (*10*) demonstrated that it is quite rapidly hydrolyzed to the ortho- form in concentrations of hydrochloric acid which are similar to that of the gastric juice. Chemical analysis showed this preparation contained 28.9 percent phosphorus. The X-ray diffraction pattern showed that it was a completely amorphous compound.

EXPERIMENTS AND RESULTS

Experiment 1.—The object of this experiment was to compare the weight gain and calcium and phosphorus storage of rats which received orthophosphate in the form of KH_2PO_4 with rats which received a crystalline metaphosphate in the form of a "fertilizer" prepared by the Tennessee Valley Authority and a crystalline chemically pure KPO_3 prepared in the laboratory. The results, shown in table 3, demonstrate the poor availability of these crystalline metaphosphates as compared with the orthophosphates.

When the data on males and females are pooled, it appears that rats which received potassium orthophosphate stored 82 percent of the ingested phosphorus, whereas rats which received potassium metaphosphate stored only 46 percent of the ingested phosphorus. In respect to calcium retention, the orthophosphate was definitely superior to the metaphosphate, the averages being 70 and 19 percent, respectively. (In connection with these *in vivo* results, the extreme insolubility of crystalline potassium metaphosphate in distilled water is noteworthy.)

Experiment 2.—The purpose of this experiment was to compare the availability of a crystalline metaphosphate, $NaPO_3$, with an ortho-

TABLE 3.—*Weight gain and calcium and phosphorus retention of rats receiving crystalline orthophosphate as compared with rats receiving crystalline metaphosphates. The effect of potassium oxalate and ferric citrate upon the retention of calcium and phosphorus when the dietary phosphorus was present in the orthophosphate and metaphosphate form*

Experiment No.	Diet No.	Description	Sex	Number of animals	Average food intake (gm.)	Average weight gain (gm. ± S. E. M.)[1]	Calcium stored (percent of intake ± S. E. M.)[1]	Phosphorus stored (percent of intake ± S. E. M.)[1]
I	563	KH_2PO_4 control	M	6	259	79±5.5	67±1.7	84±1.2
			F	4	253	74±2.9	72±3.8	79±1.7
	564	KPO_3 fertilizer, crystalline	M	6	259	72±5.6	13±3.5*	43±2.3*
			F	4	251	66±4.3*	18±4.5*	47±4.2*
	565	KPO_3 C. P. crystalline	M	6	259	77±5.1	19±3.8*	50±2.2*
			F	4	253	65±1.9*	25±4.1*	45±3.6*
II	566	$CaHPO_4$ control	M	10	280	77±3.2	66±1.5	74±1.7
			F	7	262	64±2.9	70±2.0	65±2.9
	567	$NaPO_3$ crystalline	M	10	280	77±1.5	65±1.2	77±1.5
			F	7	262	57±3.6*	66±0.9	63±3.7
III	568	KH_2PO_4+K. oxalate	M	4	241	91±7.0	60±2.3	82±3.5
	569	$NaPO_3$ crystalline+K. oxalate	M	4	242	83±8.6	49±1.3*	77±2.0
IV	570	KH_2PO_4+Fe citrate	M	4	259	70±2.1	58±3.7	70±2.1
	571	$NaPO_3$ crystalline+Fe citrate	M	4	177	44±5.5*	6±2.5*	34±2.5*
V	572	KH_2PO_4+Fe citrate	M	4	-------	74±6.2	[2]188±13	[2]237±15
			F	5	-------	72±7.6	[2]228±21	[2]240±12
	573	$NaPO_3$ amorphous+Fe citrate	M	4	-------	41±2.5*	−30±16*	73±14*
			F	5	-------	42±7.6*	−10±12*	82±14*

*The paired T test of Fisher (*11*) for significant difference between means was applied to the control and experimental groups in each experiment. An asterisk (*) adjoining the S. E. M. value indicates that the difference between this group and the corresponding control group is significant by the T test, i. e., probability of such a difference occurring by chance is one in 20 times or less. If the weight gain was computed on the basis of percent weight gain based upon initial weight, the standard error of the mean in this column would be much less for most groups.

[1] S. E. M.=standard error of the mean (*11*).

[2] No record was kept of the food consumption in this experiment. Hence the calcium and phosphorus stored cannot be expressed in percent and must be expressed as amount stored, i. e., milligrams.

phosphate, $CaHPO_4$. Table 3 shows no significant difference between the animals which received orthophosphate as compared to those which received crystalline metaphosphate in respect to availability of calcium and phosphorus. Crystalline $NaPO_3$ thus prepared is a good source of phosphorus for rats and does not adversely affect calcium retention. (The ready solubility of this crystalline sodium metaphosphate in distilled water is probably significant in connection with the *in vivo* results.)

Experiment 3.—The object of this experiment was to ascertain whether crystalline $NaPO_3$ would affect in any way the retention of calcium and phosphorus if the utilization of calcium was impaired by the presence of a high concentration of oxalate. To accomplish this purpose, the calcium content of the diet was retained at 0.21 percent and sufficient potassium oxalate was added to precipitate on a molecular basis 60 percent of the dietary calcium. Table 3 shows that 60 percent of the calcium ingested was retained by the rats which received the orthophosphate plus potassium oxalate, and 49 percent of the ingested calcium was retained by the rats fed

the crystalline sodium metaphosphate plus potassium oxalate. In respect to phosphorus storage under these conditions, the animals fed orthophosphate stored 82 percent of the ingested phosphorus as compared with 77 percent by the animals fed metaphosphate.

Experiment 4.—The objective of the experiment was to ascertain whether crystalline $NaPO_3$ would affect the retention of calcium and phosphorus in the presence of a high concentration of ferric ion. To accomplish this purpose, the calcium content of the diet was retained at 0.21 percent and sufficient ferric citrate was added to precipitate on a molecular basis all the dietary phosphorus. Table 3 shows that the controls which received orthophosphate plus ferric citrate retained 58 percent of the dietary calcium, whereas the rats which received crystalline metaphosphate plus ferric citrate stored only 6 percent of their dietary calcium. With regard to phosphorus retention, the corresponding percents for the ortho- and metaphosphate groups are 70 and 34.

Experiment 5.—This experiment was a repetition of experiment 4 except that amorphous $NaPO_3$ replaced crystalline $NaPO_3$. Table 3 shows that when ferric citrate was added in equivalent amounts to diets 572 and 573, the animals which received phosphorus in the form of amorphous sodium metaphosphate stored only one-third as much phosphorus as those which received orthophosphate. The rats which received the metaphosphate were actually on a negative calcium balance. This is in accordance with the experiments of Day and McCollum (*12*). Their explanation is that young rats on a low phosphorus intake require phosphorus for growth of soft tissue; if a sufficient amount is not available in the diet it is mobilized from the bone. The associated bone calcium can no longer be utilized in the bone and, not being required in the soft tissues, it is excreted in the urine.

SUMMARY

1. A crystalline potassium metaphosphate prepared as a "fertilizer" and a chemically pure compound prepared in the laboratory were poor sources of phosphorus for rats.

2. A crystalline sodium metaphosphate was a good source of phosphorus for rats.

3. In the presence of sufficient oxalate ion to precipitate, on a molecular basis, 60 percent of the dietary calcium, orthophosphate was more effective than crystalline metaphosphate in promoting calcium retention. (This interpretation is based on experiments on four animals in each group.)

4. In the presence of sufficient ferric ion on a molecular basis to precipitate all of the dietary phosphorus, orthophosphate was much more effective than crystalline sodium metaphosphate and amorphous

sodium metaphosphate in promoting the retention of calcium and phosphorus.

ACKNOWLEDGMENT

The authors are indebted to J. W. H. Aldred and R. L. Copson, of the Tennessee Valley Authority, for providing and analyzing the potassium metaphosphate fertilizer used in these experiments and to J. W. H. Aldred and L. H. Hull for preparing chemically pure potassium metaphosphate and chemically pure amorphous sodium hexametaphosphate.

REFERENCES

(1) Jacob, K. D.: Phosphorous supplements for livestocks: sources, supplies, and F–P relations. Feedstuffs, **16**: 18–32 (1944).
(2) Elmore, K. L.; Huffman, E. O.; and Wolf, W. W.: Defluorination of phosphate rock in the molten state. Factors affecting rate of defluorination. Ind. Eng. Chem., **34**: 40 (1942).
(3) Hill, W. L.; Reynolds, D. S.; Hendricks, S. B.; and Jacob, K. D.: Nutritive evaluation of defluorinated phosphates and other P supplements. I. Preparation and properties of the samples. J. Assoc. Official Agr. Chem., **28**: 105–118 (1945).
(4) Fraser, H. F.; Hoppe, T. C.; Sullivan, S. H.; and Smith, E. R.: Phosphate fertilizers as a possible source of phosphorous for animals. Ind. Eng. Chem., **35**: 1087–90 (1943).
(5) Barrentine, B. F.; Maynard, L. A.; and Loosli, J. K.: The availability of the Ca and P of defluorinated rock phosphate for the rat. J. Nutrit., **27**: 35–42 (1944).
(6) Ellis, N. R.; Cabell, C. A.; Elmslie, W. P.; Fraps, G. S.; Phillips, P. H.; and Williams, D. R.: Nutritive evaluation of defluorinated phosphates and other P supplements. III. Utilization experiments with rats. J. Assoc. Official Agr. Chem., **28**: 129–142 (1945).
(7) Bird, H. R.; Mattingly, J. P.; Titus, H. W.; Hammond, J. C.; Kellogg, W. L.; Clark, T. B.; Weakley, C. E.; and Van Landingham, A. H.: Nutritive evaluation of defluorinated phosphates and other P supplements. II. Defluorinated phosphates as P supplements for chicks. J. Assoc. Official Agr. Chem. **28**: 118–129 (1945).
(8) Schneider, H., and Steenbock, H.: A low phosphorous diet and the response of rats to vitamin D_2. J. Biol. Chem., **128**: 159–171 (1939).
(9) Madorsky, S. L., and Clark, K. G.: Potassium metaphosphate—a potential high analysis fertilizer material. Ind. and Eng. Chem., **32**: 244–248 (1940).
(10) Karbe, K., and Jander, G.: The metaphosphates. Kolloid-Beihefte, **54**: 1–146 (1942).
(11) Fisher, R. A.: Statistical Methods for Research Workers, 6th ed., Edinburgh and London, Oliver & Boyd, 1936.
(12) Day, H. G., and McCollum, E. V.: Mineral metabolism, growth and symptomatology of rats on a diet extremely deficient in phosphorous. J. Biol. Chem., **130**: 269–283 (1939).

CORRIGENDUM

In the notice on the Australian Quarantine Requirement (Public Health Reports, vol. 61, No. 48, Nov. 29, 1946, p. 1737) "Australian quarantine measures" and "Australian Embassy" were incorrectly printed in the first paragraph as "Austrian quarantine measures" and "Austrian Embassy," respectively.

DEATHS DURING WEEK ENDED NOVEMBER 16, 1946

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Nov. 16, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,692	8,836
Average for 3 prior years	9,010	
Total deaths, first 46 weeks of year	414,560	411,700
Deaths under 1 year of age	723	594
Average for 3 prior years	613	
Deaths under 1 year of age, first 46 weeks of year	30,422	27,890
Data from industrial insurance companies:		
Policies in force	67,319,092	67,288,845
Number of death claims	10,008	10,767
Death claims per 1,000 policies in force, annual rate	7.8	8.3
Death claims per 1,000 policies, first 46 weeks of year, annual rate	9.4	10.0

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 NOVEMBER 23, 1946

Summary

A total of 366 cases of poliomyelitis was reported, as compared with 463 last week, 221 for the corresponding week of 1944, and a 5-year (1941–45) median of 158. Decreases occurred in all of the 9 geographic divisions except the New England and East North Central areas. Of 21 States reporting 5 or more cases and showing changes from last week's figures, 7 reported an increase (72 to 109), while 11 showed a decline (253 to 158). States reporting more than 9 cases currently are as follows (last week's figures in parentheses): *Increases*—Massachusetts 12 (9), Ohio 14 (5), Indiana 14 (6), Wisconsin 23 (18), Iowa 20 (11), Texas 20 (18); *decreases*—New York 32 (44), Illinois 37 (47), Missouri 14 (26), Kansas 12 (26), California 22 (28); *no change*—Michigan, 33, Washington, 11. The total reported since the approximate date of lowest seasonal incidence (March 15) is 23,790, as compared with 12,705 and 18,449, respectively, for the corresponding periods of 1945 and 1944 and a 5-year median for the period of 11,691.

Totals reported since the approximate date of lowest incidence are below last year's corresponding figures for diphtheria, influenza, measles, meningococcus meningitis, scarlet fever, smallpox, typhoid and paratyphoid fever, and whooping cough. The total cases of Rocky Mountain spotted fever reported to date this year is 564, as compared with 464 for the corresponding period last year, and for tularemia is 861, as compared with 664 for the same period last year.

Deaths recorded during the week in 93 large cities of the United States totaled 8,945, as compared with 8,692 last week, 8,537 and 8,477, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 8,593. The cumulative total is 423,505, as compared with 420,237 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Nov. 23, 1946, and comparison with corresponding week of 1945 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Nov. 23, 1946	Nov. 24, 1945		Nov. 23, 1946	Nov. 24, 1945		Nov. 23, 1946	Oov. 24, 1945		Nov. 23, 1946	Nov. 24, 1945	
NEW ENGLAND												
Maine	4	3	2	------	4	------	185	1	2	0	0	0
New Hampshire	0	4	0	------	------	------	56	------	5	0	0	1
Vermont	0	0	0	------	------	------	91	------	3	1	0	0
Massachusetts	12	3	5	------	------	------	190	110	110	1	2	4
Rhode Island	1	0	0	------	------	------	60	1	2	1	0	1
Connecticut	1	0	0	1	------	1	15	5	15	5	1	1
MIDDLE ATLANTIC												
New York	28	13	14	3	5	5	112	99	136	2	14	14
New Jersey	5	1	2	6	3	4	40	16	16	2	2	4
Pennsylvania	17	7	10	3	2	1	200	364	332	6	5	6
EAST NORTH CENTRAL												
Ohio	25	58	20	[1] 9	[1] 7	[1] 9	81	21	28	6	4	4
Indiana	18	16	13	5	284	4	9	3	13	2	5	1
Illinois	6	3	9	1	4	6	6	204	35	3	5	5
Michigan [2]	20	41	12	2	2	1	22	177	62	2	3	4
Wisconsin	9	1	1	7	94	19	58	16	38	1	0	1
WEST NORTH CENTRAL												
Minnesota	17	8	8	------	------	------	8	4	5	4	2	2
Iowa	4	8	6	------	------	1	11	1	18	2	0	0
Missouri	6	9	9	3	4	4	2	32	7	2	7	1
North Dakota	0	1	6	------	48	------	1	3	3	0	0	0
South Dakota	0	2	2	------	------	------	2	------	2	0	0	0
Nebraska	2	0	5	11	25	------	2	1	11	0	1	0
Kansas	7	7	6	1	1	1	10	18	18	4	0	0
SOUTH ATLANTIC												
Delaware	1	0	0	------	------	------	------	------	1	0	0	0
Maryland [2]	7	19	11	4	5	5	12	5	16	0	0	1
District of Columbia	0	0	0	1	------	1	1	1	2	0	0	0
Virginia	13	26	26	230	607	259	74	63	63	0	0	1
West Virginia	14	7	7	5	150	13	16	------	5	0	1	1
North Carolina	21	73	35	------	------	2	52	12	12	2	3	1
South Carolina	7	15	15	384	829	415	12	10	8	1	1	1
Georgia	4	22	21	20	26	28	49	1	3	2	0	0
Florida	12	3	8	2	6	2	6	4	8	1	0	0
EAST SOUTH CENTRAL												
Kentucky	16	12	10	------	1	2	25	38	32	1	1	2
Tennessee	5	37	15	10	96	31	5	3	13	2	4	4
Alabama	9	30	23	42	150	54	9	1	3	0	1	1
Mississippi [2]	9	13	12	------	------	------	------	------	------	1	2	1
WEST SOUTH CENTRAL												
Arkansas	7	37	15	20	81	81	6	19	19	0	1	1
Louisiana	8	18	9	130	1	3	------	3	1	0	1	0
Oklahoma	9	11	11	24	41	64	4	4	4	1	1	0
Texas	30	73	66	1,286	2,056	837	42	39	27	3	5	5
MOUNTAIN												
Montana	0	1	1	9	39	6	12	4	13	0	1	0
Idaho	1	3	0	21	14	1	1	127	8	1	0	0
Wyoming	2	0	0	5	45	18	6	4	7	0	0	0
Colorado	3	6	6	32	303	17	6	7	13	1	0	1
New Mexico	3	9	4	------	3	2	27	3	3	1	0	0
Arizona	4	2	2	101	49	70	4	2	5	0	1	0
Utah [2]	0	0	0	1	225	3	11	21	21	0	0	0
Nevada	1	0	0	------	------	------	------	------	------	0	0	0
PACIFIC												
Washington	8	6	5	------	------	1	16	218	15	0	1	1
Oregon	1	9	2	6	7	9	20	8	25	2	0	0
California	19	36	34	19	23	27	105	263	138	11	6	7
Total	396	653	435	2,404	5,240	2,465	1,682	1,936	2,464	74	81	93
47 weeks	14,462	16,163	13,851	209,166	97,820	98,408	651,631	115,850	566,993	[3] 5,332	7,395	7,395

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed report: Meningitis, Maine, 1 case, included in cumulative total.

Telegraphic morbidity reports from State health officers for the week ended Nov. 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Nov. 23, 1946	Nov. 24, 1945		Nov. 23, 1946	Nov. 24, 1945		Nov. 23, 1946	Nov. 24, 1945		Nov. 23, 1946	Nov. 24, 1945	
NEW ENGLAND												
Maine	[5] 0	0	0	49	24	24	0	0	0	0	1	0
New Hampshire	4	0	0	1	2	13	0	0	0	0	0	0
Vermont	4	1	1	3	15	7	0	0	0	0	0	0
Massachusetts	12	7	4	73	104	170	0	0	0	4	2	1
Rhode Island	1	0	0	14	5	5	0	0	0	0	0	0
Connecticut	1	5	3	20	21	24	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	32	18	15	212	210	216	0	0	0	7	3	3
New Jersey	6	4	3	66	26	62	0	0	0	1	0	1
Pennsylvania	6	3	3	118	176	176	0	0	0	2	1	7
EAST NORTH CENTRAL												
Ohio	14	9	8	247	230	237	2	0	0	3	2	3
Indiana	14	1	1	82	59	59	0	3	1	2	2	1
Illinois	37	18	5	126	147	160	0	0	2	1	1	3
Michigan [2]	33	6	6	129	139	139	0	1	1	0	3	1
Wisconsin	23	12	3	83	63	111	0	0	0	1	1	1
WEST NORTH CENTRAL												
Minnesota	7	3	4	25	38	50	0	0	0	0	0	0
Iowa	20	2	1	23	44	52	0	0	0	1	0	0
Missouri	14	10	3	26	42	58	1	0	0	0	4	0
North Dakota	2	0	0	1	4	6	0	0	0	0	1	0
South Dakota	3	0	0	11	7	23	0	0	0	1	1	0
Nebraska	9	3	2	26	52	27	0	0	0	0	0	0
Kansas	12	1	2	32	59	70	0	0	0	2	3	1
SOUTH ATLANTIC												
Delaware	2	2	0	6	4	4	0	0	0	1	0	0
Maryland [2]	3	1	1	19	38	43	0	0	0	2	0	0
District of Columbia	1	1	0	6	12	21	0	0	0	1	0	0
Virginia	6	1	2	47	131	61	0	0	0	1	3	3
West Virginia	2	2	0	48	87	68	0	0	0	0	1	1
North Carolina	0	1	3	22	91	95	0	0	0	0	1	1
South Carolina	0	2	0	13	8	9	0	0	0	1	0	1
Georgia	3	1	0	13	42	42	0	0	0	0	2	1
Florida	3	1	1	10	2	9	1	0	0	0	2	2
EAST SOUTH CENTRAL												
Kentucky	0	0	2	52	50	57	0	0	0	3	3	3
Tennessee	3	7	3	26	79	84	1	0	0	2	0	3
Alabama	2	1	0	14	19	20	0	0	0	0	5	1
Mississippi [2]	2	2	2	9	22	21	0	3	0	0	1	1
WEST SOUTH CENTRAL												
Arkansas	[5] 7	0	0	5	20	15	0	0	0	1	0	2
Louisiana	3	4	0	4	14	7	0	0	0	2	0	3
Oklahoma	6	1	1	12	21	23	0	0	0	0	1	1
Texas	20	4	7	48	111	93	0	0	0	5	15	7
MOUNTAIN												
Montana	3	0	1	11	7	22	0	1	1	0	3	1
Idaho	2	0	0	8	6	6	0	0	0	0	0	0
Wyoming	0	0	0	1	3	3	0	0	0	0	0	0
Colorado	6	1	1	29	24	29	0	0	0	0	1	1
New Mexico	1	0	0	7	7	7	0	0	0	0	1	1
Arizona	0	1	1	8	12	5	0	0	0	0	0	1
Utah [2]	0	1	1	14	17	17	0	0	0	0	0	0
Nevada	1	0	0	1	2	1	0	0	0	0	0	0
PACIFIC												
Washington	11	7	5	39	34	34	0	0	0	0	1	1
Oregon	3	2	3	29	20	20	0	0	0	1	0	0
California	22	28	13	143	224	201	0	0	0	4	1	1
Total	366	174	158	2,011	2,574	2,642	5	8	11	50	66	70
47 weeks	24,256	13,102	11,993	102,994	159,167	124,926	324	320	687	3,785	4,597	5,155

[2] Period ended earlier than Saturday.

[4] Including paratyphoid fever reported separately, as follows: Massachusetts 4 (salmonella infection); Connecticut 1; Ohio 1; California 3.

[5] Corrections: Poliomyelitis, Maine, week ended October 26, 1 case (instead of 2); Arkansas, week ended November 9, 6 cases (instead of 5), Utah, 1 additional October case.

Telegraphic morbidity reports from State health officers for the week ended Nov. 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended Nov. 23, 1946							
	Week ended—		Median 1941–45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Nov. 23, 1946	Nov. 24, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	16	15	23								
New Hampshire	8										
Vermont	25	28	31								3
Massachusetts	156	150	134				1				1
Rhode Island	45	35	26								1
Connecticut	64	42	70	1							1
MIDDLE ATLANTIC											
New York	269	303	303	13	14						3
New Jersey	175	140	140								1
Pennsylvania	192	206	206	1	2				2		
EAST NORTH CENTRAL											
Ohio	89	154	154	1							1
Indiana	31	17	18						3		6
Illinois	93	143	143	10	3		3		2		11
Michigan [2]	226	142	222	2					3		7
Wisconsin	177	90	172								9
WEST NORTH CENTRAL											
Minnesota	6	19	41	5							1
Iowa	14	7	12	2							25
Missouri	30	3	16						1		1
North Dakota	2		5								
South Dakota			3								1
Nebraska	8	8	8								
Kansas	3	25	39	1					3		3
SOUTH ATLANTIC											
Delaware	8		3			1					
Maryland [2]	33	33	53			1					
District of Columbia	10	5	5								
Virginia	42	37	42			31				1	3
West Virginia	15	30	17						1		
North Carolina	17	64	77								
South Carolina	38	55	31	5	10				5	1	
Georgia	13	5	5						2	10	4
Florida	6		9							5	
EAST SOUTH CENTRAL											
Kentucky	13	42	42								1
Tennessee	19	15	26	1					2	1	1
Alabama	19	40	21							3	3
Mississippi [2]									1	1	2
WEST SOUTH CENTRAL											
Arkansas	22	6	10		1		1		1		
Louisiana	5	1	3							5	4
Oklahoma		12	8								1
Texas	119	78	102	20	275	89				15	10
MOUNTAIN											
Montana	1	2	16								
Idaho	1	11	3		10				1		1
Wyoming	4		1								
Colorado	6	23	31		8						
New Mexico	4	16	4			1					
Arizona	15	1	4			23	1				
Utah [2]	5	6	14								
Nevada		2	1								
PACIFIC											
Washington	7	53	32								
Oregon	7	8	8	1							
California	53	112	117	3	12		3			3	3
Total	2,111	2,184	2,455	66	335	146	9	0	27	45	108
Same week, 1945	2,184			37	276	94	8	2	14	106	55
Average, 1943–45	2,102			34	486	81	9	[6] 2	10	[6] 106	
47 weeks: 1946	89,685			2,231	14,969	5,931	583	564	861	3,165	4,824
1945	113,691			1,777	22,868	9,951	587	464	664	4,761	4,513
Average, 1943–45	122,328		[6]162,372	1,803	20,337	8,424	606	[6] 453	631	[6] 4,064	

[2] Period ended earlier than Saturday.
[6] 5-year median, 1941–45.

NOTIFIABLE DISEASES, THIRD QUARTER, 1946[1]

The figures in the following table are the totals of the monthly morbidity reports received from the State health authorities for July, August, and September 1946. These reports are preliminary and the figures are therefore more or less incomplete and subject to correction by final reports. In most instances they include cases reported in both civilian and military populations. The comparisons made are with similar preliminary reports; but, owing to population shifts and the presence of large military populations in certain States, the figures for some States may not be comparable with those for prior years, especially for certain diseases. Each State health officer has been requested to include in the monthly report for his State all diseases that are required by law or regulation to be reported in the State, although some do not do so. The lists of diseases required to be reported are not the same for each State. Only 11 of the common communicable diseases are notifiable in all the States. In some instances cases are reported, in some States, of diseases that are not required by law or regulation to be reported and the figures are included although manifestly incomplete. There are also variations among the States in the degree of, and checks on, the completeness of reporting of cases of the notifiable diseases; therefore comparisons as between States may not be justified for certain diseases. As compared with the deaths, incomplete case reports are obvious for such diseases as malaria, pellagra, pneumonia, and tuberculosis, while in many States other diseases, such as puerperal septicemia, rheumatic fever, and Vincent's infection, are not reportable.

In spite of these known deficiencies, however, these monthly reports, which are published quarterly and annually in consolidated form, have proved of value in presenting early information regarding the reported incidence of a large group of diseases and in indicating trends by providing a comparison with similar preliminary figures for prior years. The table gives a general picture of the geographic prevalence of certain diseases, as the States are arranged by geographic areas.

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

Consolidated monthly State morbidity reports for July, August, and September 1946

Division and State	Anthrax	Chickenpox	Conjunctivitis[2]	Diphtheria*	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, infectious	German measles	Hookworm disease	Influenza	Malaria[3]	Measles*	Meningitis, meningococcus*	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENGLAND																		
Maine		150		27	1		1		50		11	17	364	7	240			92
New Hampshire		24		1	1				11		1	1	218	5	23			4
Vermont		120		10					74		1		486		176			6
Massachusetts		753	49	104	1	11		1	236			80	3,138	16	459	24		[4] 136
Rhode Island		20		9	1	3			2		5	38	206	7	15			42
Connecticut		261		11	11	1			59	1	7	58	779	15	660			281
MIDDLE ATLANTIC																		
New York	2	1,641		162	58	86		11	[5] 166	22	[5] 46	411	4,601	71	[5] 737	14		1,710
New Jersey		783		40	5	6	16	3	223		25	166	1,607	26	1,027	1		560
Pennsylvania		754		114	5	1		3			13	[6] 1	1,907	61	825	5		403
EAST NORTH CENTRAL																		
Ohio		595		113	67	3	3	5	132		10	84	2,134	40	806	156		385
Indiana		111		44	5			26	5		22	96	149	16	99			25
Illinois		870		85	62	11		9	68		15	[5] 111	651	49	337	91		750
Michigan		758	7	80	13	17	1	1	157		21	310	1,115	29	571	5		339
Wisconsin		1,196		60	5			1	257		121	8	2,326	15	1,667			[4] 67

WEST NORTH CENTRAL																		
Minnesota		122		65	[7] 34		3	1		[6] 2	12	221	148	13				28
Iowa		81		28	16			4	4			45	273	17	144			[8] 2, 101
Missouri		30		43			7	6	1		10	107	149	20	64			126
North Dakota		27	1	13	3	3	3	10			31	4	44	2				89
South Dakota		16		15								5	27	4	12			1
Nebraska		30		16				3			23	40	65	8	24			11
Kansas		56		81				8	13		19	7	82	7	176			117
SOUTH ATLANTIC																		
Delaware		20		1								2	23	2	7			3
Maryland		82		79		3	4	2	48		11	9	759	16	85	5		178
District of Columbia		34		1		5						2	201	14	27		1	213
Virginia		152		120	2		1, 152				1, 266	144	659	30	207		5	412
West Virginia		44		38			1	1			13	9	100	13	39			28
North Carolina				121	1	2						65	315	17				
South Carolina		52		39	15	164			20	185	1, 038	1, 944	370		165		138	390
Georgia		20	11	104	17	35	2	2		1, 428	42	139	168	7	29		9	130
Florida		34	38	94	12	2	9	4	8	542	29	137	130	17	270	4	4	154
EAST SOUTH CENTRAL																		
Kentucky		30		103	1	27		2	4		2	53	336	14	60		3	100
Tennessee		54	1	56	10	20	6	6	7	4	168	102	166	16	31	1	9	302
Alabama		14		103	13			8	32		189	630	177	16	34		7	604
Mississippi		482		106	372	1, 891				1, 416	5, 503	7, 488	756	11	730	10	583	2, 261
WEST SOUTH CENTRAL																		
Arkansas		20		63	29	20		4			66	533	114	14	114		4	66
Louisiana		26		72	39	17			7	41	62	359	151	17	92	1	1	558
Oklahoma		34		31	7	4	1	8	2		63	175	149	11	43		5	74
Texas		380		273	299	3, 331	324	15			3, 843	1, 943	1, 298	51	1, 670	17	236	930
MOUNTAIN																		
Montana		138		8			2	2	28		30		270	5	79			105
Idaho		55	3	11	2		12	1	32		101	15	77	1	103			28
Wyoming		18		7	2			1	4		2	12	65		34			7
Colorado		84		58	7	4		2	27		79	8	247	6	123			119
New Mexico		15		28	2	24	45	1	6		11	17	131	2	41		2	127
Arizona		55	2	45			310	5	18		188	46	221	4	141	1		74
Utah		319		4	1	3	2	1	33		2	33	273	4	386			44
Nevada		5	6			5	4	5			1	4	16	2	4			10
PACIFIC																		
Washington		207		112	2	23	10	20	86		9	6	206	8	210			110
Oregon		98		29	7		12	2			10	5	305	5	194			114
California		1, 421	15	258	46	78		105	509		70	220	2, 167	98	1, 654			[4] 331
Total	2	12, 291	133	3, 085	1, 174	5, 800	1, 930	289	2, 329	3, 641	13, 191	15, 910	30, 319	829	14, 634	335	1, 007	14, 745
Third quarter 1945	18	13, 629	132	4, 070	998	12, 175	5, 732	340	2, 161	3, 479	14, 142	22, 246	14, 178	1, 283	18, 109	337	1, 110	13, 827
Median 1941–45	18	13, 304		3, 101	1, 009	11, 817	4, 396	275	3, 409	3, 955	11, 782	23, 894	21, 471	1, 283	17, 034	337	1, 456	13, 827
Alaska [9]		29		33		1			1		81		44		2			22
Hawaii Territory		139	4	2		20			116	1	1	[10] 28	72	1	41			[4] 25
Panama Canal Zone [11]		17		38	8	15						139	522		20			[12] 186

See footnotes on page 1826.

Consolidated monthly State morbidity reports for July, August, and September 1946—Continued

Division and State	Poliomyelitis*	Rabies in man	Rheumatic fever	Rocky Mountain spotted fever	Scarlet fever*	Septic sore throat	Smallpox*	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms*	Tuberculosis, respiratory	Tularemia	Typhoid and paratyphoid fever*	Paratyphoid fever	Typhus fever, endemic	Undulant fever*	Vincent's infection	Whooping cough*
NEW ENGLAND																			
Maine	16				146	5		4		1	129	120		[13] 27	[13] 23		9	5	152
New Hampshire	123				57	21					89			5	1		5	3	70
Vermont	22				23	9					61			1			25	4	187
Massachusetts	172			1	432	25		2		7	840	789		95	79	2	19		1,580
Rhode Island	54		17		38	4		1			103	95		7	3		3	1	287
Connecticut	47				85	59		1		2	240	230		6			33		407
MIDDLE ATLANTIC																			
New York	835			12	[14] 977			13		40	3,340	3,177		97	15	6	85		1,775
New Jersey	160	2		12	281	19		3	1	5	877			44	18	1	17		1,809
Pennsylvania	165		100	13	553			3		2	935			[13] 92	[13] 14	1	24		1,431
EAST NORTH CENTRAL																			
Ohio	494	3	17	8	807	4	4	7		8	1,297		1	74	13	1	32	5	1,216
Indiana	243			10	185	47	5	6	2		740	707	7	54	4	1	64	10	289
Illinois	1,706	2	58	34	412	30	1	9	9		1,029	916	7	40	6		124	90	1,987
Michigan	678		64		489	41		7		3	1,585			[13] 85	[13] 31		37		2,634
Wisconsin	919				354	68	2				512		2	7	1		107		2,866
WEST NORTH CENTRAL																			
Minnesota	2,461		11		167	90					[7] 526		6	[13] 16	[13] 10		73	21	150
Iowa	381		5	2	127	10	2	2	1		190		3	6			103		374
Missouri	894			9	106	16	1				581		15	31			27		211
North Dakota	386		1		12	1					61	61	1	4			2	28	15
South Dakota	316			1	21	4			2		80			5			19	1	14
Nebraska	405				89						187			7	1		15		44
Kansas	721		2		137	15	1	1	4		139	138	2	18	1		60	22	286
SOUTH ATLANTIC																			
Delaware	20			8	23						52	52		5			1		59
Maryland	67		31	19	100	20		6			733	710	1	15			7	9	378
District of Columbia	19			3	36						853	827	1	9	1				106
Virginia	78			59	223	490		1			1,325	1,325	16	60	4		21		939
West Virginia	49			8	220	3	1				570			26	2		6		304
North Carolina	67			45	212	11					1,093	1,066	11	22	1	36	6		1,050
South Carolina	8		76	2	25	5		1		2	98		1	34	2	17	15		365
Georgia	103	1	11	24	103	62		1			565	559	8	48	16	250	45	35	96
Florida	218				40	25		8			309	308	3	29	6	174	20	24	283

EAST SOUTH CENTRAL																		
Kentucky	74			11	153	4	1	3	25		554	546	3	44	4	2	13	5	473
Tennessee	117	1	1	23	153	43		12		6	1,215		29	49	1	15	19	52	326
Alabama	251	1		5	108			11			994		1	18		173	31		406
Mississippi	207			1	74				7		565	560	13	42		47	43		1,902
WEST SOUTH CENTRAL																		
Arkansas	280	2			40	79	2	5	110	1	306	294	82	52	7	24	31		113
Louisiana	231		47	2	37	76		16			506	484	6	91	13	122	19		96
Oklahoma	266	1		21	49	36	4	2	66		537		8	29	2	1	10	5	150
Texas	507			2	267	216	2		18		1,566		14	203	24	463	213		2,114
MOUNTAIN																		
Montana	85		1		40	16					130	55	3	15			3	2	52
Idaho	27		14	1	53	66	6		14		55		3	28	16		15	29	134
Wyoming	105			2	16	10					9		6	5			1	5	50
Colorado	718		94		198	42	1		2		52			10	2		12	20	203
New Mexico	127				34	1			13		[7] 439	[7] 420		20	3	1	3		145
Arizona	82				51				72		277			24	1	1	8	4	75
Utah	96		10	1	72						56	51	9	2	2		9		136
Nevada	11				11	16			3		74		1	1			3	13	31
PACIFIC																		
Washington	270		59		132	8					[15] 364			20	7		14	164	344
Oregon	112		16	4	100	24		1	15		193	188		22	7		5		253
California	1,464		206	1	819	33		19	8	9	2,663	2,500	3	71	21	19	62		849
Total	16,857	13	841	344	8,887	1,754	33	145	372	86	29,694	16,178	266	[13] 1,715	[13] 362	1,357	1,518	557	29,216
Third quarter 1945	8,275	6	1,211	266	12,988	2,051	38	154	360	23	29,392	17,263	201	[13] 2,090	[13] 281	2,086	1,227	484	34,371
Median 1941–45	8,186	6		234	11,912	1,209	62	151	621	48	29,392	17,263	208	2,503		1,770	1,187	484	46,158
Alaska [9]	1				1	3					81			1				2	4
Hawaii Territory	4				6	23		1			[3] 56			2	1	33			7
Panama Canal Zone					1						[12] 18			9	6	1			[12] 6

See notes on page 1826.

FOOTNOTES FOR TABLE ON PAGES 1822 TO 1825

*Diseases marked with an asterisk (*) are reportable by law or regulation in all the States, including the District of Columbia. Typhoid fever is reportable in all the States; paratyphoid fever in all except 6 States. Syphilis is reportable in all the States and the District of Columbia, but is not included in the table.

[1] For reports for first and second quarters of 1946, see pp. 836 and 1356 of the PUBLIC HEALTH REPORTS for June 7 and Sept. 13, 1946, respectively.
[2] Includes cases of kerato- and suppurative conjunctivitis and of pink eye.
[3] In a few States, practically all contracted outside the Continental United States.
[4] Lobar pneumonia only.
[5] New York City only; figures for some diseases for New York City include supplemental reports not included in previous quarters.
[6] Includes 1 case acquired through blood transfusion.
[7] Includes nonresidents.
[8] Includes delayed reports.
[9] Corrected figures for Alaska for the second quarter of 1946: Chickenpox 63, diphtheria 2, German measles 18, influenza 84, measles 67, mumps 37, pneumonia 23, septic sore throat 8, tuberculosis (all forms) 90, tuberculosis (respiratory) 76, tularemia 1, Vincent's infection 2, whooping cough 5.
[10] Off-shipping.
[11] Includes the cities of Colon and Panama.
[12] In the Canal Zone only.
[13] Includes cases reported as "salmonella infections."
[14] Includes septic sore throat.
[15] For 2 months only.

The following list includes certain rare conditions, diseases of restricted geographical distribution, and those reportable in or reported by only a few States; last year's figures in parentheses (where no figures are given, no cases were reported last year):

Actinomycosis: Minnesota 1 (3).
Coccidioidomycosis: New Mexico 1 (1), California 7 (5).
Dengue: South Carolina 1 (8), Florida 1, Mississippi 1 (10), Texas 4 (7).
Diarrhea: New York 29, New Jersey 19 (1), Pennsylvania 1, Ohio 383 (835) (includes enteritis), Illinois 48, Michigan 1 (2), Maryland 25 (74), South Carolina 2,484 (4,429), Florida 15 (9), Montana 1, Idaho 1, Colorado 5 (1), Oregon 5 (4) (includes enteritis), California 11 (19), Alaska 2.
Dog bite: Illinois 4,080 (3,278), Michigan 2,646 (2,713), Arkansas 133 (121).
Favus: Michigan 2.
Filariasis: New Jersey 1 (1).
Food poisoning: Maine 82 (2), New Jersey 4, Indiana 3 (1), Illinois 4, Kansas 85, Louisiana 6 (5), Idaho 2 (2), New Mexico 2, Washington 16 (71), Oregon 3, California 30 (89).
Granuloma (unspecified): Ohio 2 (19).
Granuloma inguinale: Missouri 3 (6), Florida 63 (69), Tennessee 30 (18), Mississippi 150 (177), Louisiana 73 (75).
Impetigo contagiosa: New York 22, Ohio 12 (2), Indiana 19 (10), Illinois 17 (11), Michigan 200 (200), North Dakota 4 (3), Kansas 16 (15), Montana 13 (24), Idaho 25 (2), Wyoming 11, Colorado 3, Nevada 48 (32), Washington 179 (117), Hawaii Territory 7 (18).
Jaundice (including hepatitis and Weil's disease): Maine 1 (4), New York 67, Pennsylvania 4, Indiana 5 (32), Illinois 11 (102), Michigan 7 (2), Minnesota 20 (21), Nebraska 2, Kansas 2, Maryland 3 (1), Florida 4 (6), Tennessee 2, Idaho 11 (13), Utah 1 (3), Oregon 15 (2), California 69 (66).
Leprosy: New York 1, Illinois 1 (1), Louisiana 2 (3), Texas 6, Hawaii Territory 9 (3).
Lymphocytic choriomeningitis: Massachusetts 2 (2), Tennessee 6 (10).
Lymphogranuloma venereum: Missouri 9 (12), Florida 66 (63), Tennessee 32 (27), Louisiana 24 (45), Utah 4 (3), Nevada 1.
Psittacosis: North Carolina 1.
Puerperal septicemia: Ohio 1, Florida 1 (1), Tennessee 3, Mississippi 55 (29), New Mexico 1, Nevada 1.
Rabies in animals: New Hampshire 1, Massachusetts 1, New York 320 (116), Ohio 254 (173), Illinois 89 (104), Iowa 19 (15), Missouri 7 (6), Kansas 2 (4), Maryland 2 (8), South Carolina 34 (19), Florida 7 (2), Alabama 135 (188), Arkansas 36 (33), Louisiana 11 (14), Texas 229 (190), Colorado 2, Utah 4 (1), California 72 (95).
Rat bite fever: Tennessee 1.
Relapsing fever: Texas 1 (9), Idaho 1, Nevada 2 (14), California 8 (3).
Ringworm: Pennsylvania 116 (214), Ohio 17 (4), Indiana 168 (9), Illinois 113 (240), Michigan 125 (200), Minnesota 81 (82), Iowa 24, Missouri 1 (4), Kansas 1 (1), Montana 1, Idaho 30, Wyoming 1, Washington 91 (45).
Scabies: Pennsylvania 103 (14), Ohio 3, Michigan 123 (103), Missouri 3 (2), Kansas 10 (11), Maryland 2 (28), Montana 9 (33), Idaho 12 (10), Wyoming 1, Nevada 30 (20).
Silicosis: New Hampshire 2, Idaho 2 (1), New Mexico 2 (2).

WEEKLY REPORTS FROM CITIES [1]

City reports for week ended Nov. 16, 1946

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever casse	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	3	0	6	0	0	1
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	4	0	------	0	10	1	1	7	17	0	0	32
Fall River	0	0	------	0	------	0	1	0	0	0	0	------
Springfield	0	0	------	0	14	0	0	0	1	0	0	17
Worcester	0	0	------	0	------	0	3	2	2	0	0	33
Rhode Island:												
Providence	0	0	1	0	2	0	3	1	6	0	0	26
Connecticut:												
Bridgeport	0	0	------	0	------	0	0	0	1	0	0	------
Hartford	0	0	1	0	------	0	1	1	1	0	0	------
New Haven	0	0	------	0	5	0	0	0	2	0	0	5
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	------	0	------	0	2	1	7	0	0	4
New York	13	0	10	0	24	4	60	30	46	0	1	38
Rochester	0	0	------	0	------	0	2	0	6	0	0	------
Syracuse	0	0	------	0	------	0	1	2	6	0	0	12
New Jersey:												
Camden	2	0	------	0	------	1	2	0	0	0	0	9
Newark	0	0	1	0	------	0	4	0	4	0	0	21
Trenton	0	0	------	0	2	0	4	0	0	0	0	------
Pennsylvania:												
Philadelphia	2	0	3	0	2	2	20	2	33	0	0	31
Pittsburgh	0	0	------	0	110	2	6	0	17	0	0	4
Reading	0	0	------	0	------	0	3	0	0	0	0	8
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	3	0	------	0	10	3	5	1	10	0	0	5
Cleveland	1	0	6	0	37	1	9	2	17	0	0	21
Columbus	3	0	1	1	1	0	2	0	21	2	0	10
Indiana:												
Fort Wayne	0	0	------	0	4	0	3	0	0	0	0	------
Indianapolis	2	0	------	2	------	0	7	2	9	0	0	27
South Bend	0	0	------	0	------	0	0	0	3	0	0	------
Terre Haute	0	0	------	0	------	0	0	0	2	0	0	------
Illinois:												
Chicago	1	0	------	0	7	0	26	15	33	0	0	48
Michigan:												
Detroit	8	0	------	0	8	0	16	6	40	0	0	53
Flint	0	0	------	0	------	0	1	2	1	0	0	12
Grand Rapids	0	0	------	0	1	0	2	1	4	0	0	6
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	1	4	0	0	------
Milwaukee	0	0	------	0	12	1	5	2	7	0	0	127
Racine	0	0	------	0	2	0	0	1	5	0	0	1
Superior	0	0	------	0	------	0	0	1	1	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	------	0	1	3	4	0	0	2
Minneapolis	1	0	------	3	------	0	1	2	12	0	0	------
St. Paul	0	0	------	0	2	0	0	0	3	0	0	5
Missouri:												
Kansas City	0	0	------	0	------	0	5	4	5	0	0	------
St. Joseph	0	0	------	0	------	0	0	0	1	0	0	
St. Louis	7	0	------	0	------	1	9	10	11	0	0	

[1] In some instances the figures include nonresident cases.

City reports for week ended Nov. 16, 1946—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	2	0	4	7	6	0	0	1
Kansas:												
Topeka	2	0	------	0	------	0	0	2	1	0	0	------
Wichita	1	0	------	0	------	0	3	0	6	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	------	0	1	0	2	0	0	7
Maryland:												
Baltimore	4	0	1	1	4	2	7	2	9	0	0	38
Cumberland	0	0	------	0	1	0	0	0	0	0	0	------
Frederick	0	0	------	0	15	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	0	2	0	8	1	7	0	0	4
Virginia:												
Richmond	0	0	------	0	16	0	1	4	5	0	0	3
Roanoke	1	0	------	0	1	0	0	0	3	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	1	0	0	0	1	0	0	1
North Carolina:												
Raleigh	0	0	------	0	------	0	0	0	0	0	0	3
Wilmington	0	0	------	0	------	0	0	0	0	0	0	------
Winston-Salem	0	0	------	0	24	0	2	0	3	0	0	2
South Carolina:												
Charleston	0	0	6	0	5	0	1	0	0	0	0	------
Georgia:												
Atlanta	0	0	4	1	------	0	3	0	3	0	1	------
Brunswick	0	0	------	0	------	0	1	0	0	0	0	------
Savannah	0	0	------	0	9	0	1	0	0	0	0	------
Florida:												
Tampa	3	0	------	0	------	0	3	1	2	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	1	------	0	3	1	7	3	3	0	0	2
Nashville	1	0	------	0	------	0	2	0	1	0	0	2
Alabama:												
Birmingham	0	0	1	0	------	0	1	0	4	0	1	------
Mobile	3	1	------	3	------	0	0	0	0	0	0	1
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	------	0	1	0	0	0	0	------
Louisiana:												
New Orleans	5	0	1	1	3	4	6	12	4	0	2	5
Shreveport	1	0	------	1	------	0	2	0	0	0	0	------
Texas:												
Dallas	2	0	------	0	1	0	2	0	2	0	2	------
Galveston	0	0	------	0	------	0	0	0	2	0	0	------
Houston	1	0	------	0	------	0	6	6	1	0	0	------
San Antonio	0	0	2	0	2	0	2	2	2	0	0	4
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	0	0	0	------
Great Falls	1	0	------	0	2	0	1	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	1	0	0	------
Missoula	0	0	------	0	1	0	3	0	1	0	0	------
Colorado:												
Denver	2	0	3	0	4	0	9	0	12	0	0	2
Pueblo	3	0	------	0	------	0	1	3	0	0	0	------
Utah:												
Salt Lake City	0	0	------	0	2	0	0	0	1	0	0	------

City reports for week ended Nov. 16, 1946—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0	.....	0	1	0	6	3	1	0	0	5
Spokane	0	0	.....	0	1	1	3	3	4	0	0	2
California:												
Los Angeles	8	0	1	0	1	7	6	2	0	0	0	1
Sacramento	0	0	.....	0	.....	0	2	0	2	0	0	.....
San Francisco	3	0	1	0	1	0	6	1	4	0	0	3
Total	93	2	43	13	355	31	309	151	441	2	7	650
Corresponding week, 1945	77	.....	73	20	460	.....	307	.....	593	0	19	628
Average, 1941–45	91	.....	114	[2] 23	[3] 525	.....	[2] 344	.....	734	0	15	799

[2] 3-year average, 1943–45.
[3] 5-year median, 1941–45.

Dysentery, amebic.—Cases: New York 3; Chicago 2; Detroit 1; Los Angeles 1.
Dysentery, bacillary.—Cases: New York 1; Philadelphia 1; Charleston, S. C., 1; San Antonio 4; Los Angeles 3.
Dysentery, unspecified.—Cases: Wilmington, Del., 1; San Antonio 8.
Tularemia.—Cases: St. Louis 1.
Typhus fever, endemic.—Cases: Charleston, S. C., 1; Atlanta 1; Savannah 1; Mobile 1; Little Rock 1; New Orleans 13; Dallas 1; San Antonio 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1943, 34,102,900)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	10.5	0.0	5.2	0.0	81	2.6	31.4	28.8	94	0.0	0.0	298
Middle Atlantic	8.3	0.0	6.5	0.0	64	4.2	48.1	16.2	55	0.0	0.5	59
East North Central	11.0	0.0	4.3	1.8	50	3.1	46.6	20.9	96	1.2	0.0	190
West North Central	24.1	0.0	0.0	6.0	8	2.0	46.3	56.3	99	0.0	0.0	28
South Atlantic	13.2	0.0	18.2	3.3	129	3.3	46.3	13.2	58	0.0	1.7	96
East South Central	29.5	11.8	5.9	17.7	18	5.9	59.0	17.7	47	0.0	5.9	30
West South Central	25.8	0.0	8.6	5.7	17	11.5	54.5	57.4	32	0.0	11.5	26
Mountain	49.6	0.0	24.8	0.0	74	0.0	115.6	24.8	124	0.0	0.0	17
Pacific	21.4	0.0	3.3	0.0	7	13.2	37.8	14.8	18	0.0	0.0	18
Total	14.3	0.3	6.6	2.0	54	4.8	47.4	23.2	68	0.3	1.1	100

TERRITORIES AND POSSESSIONS

Puerto Rico

Notifiable diseases—4 weeks ended November 2, 1946.—During the 4 weeks ended November 2, 1946, cases of certain notifiable diseases were reported in Puerto Rico as follows:

Disease	Cases	Disease	Cases
Chickenpox	11	Syphilis	207
Diphtheria	51	Tetanus	9
Dysentery, unspecified	3	Tetanus, infantile	1
Gonorrhea	130	Tuberculosis (all forms)	709
Influenza	106	Typhoid and paratyphoid fever	26
Malaria	529	Typhus fever (murine)	8
Measles	4	Whooping cough	100
Poliomyelitis	56		

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 2, 1946.—During the week ended November 2, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		19	2	147	212	38	17	59	151	645
Diphtheria		3	4	43	16	4	1		1	72
Encephalitis, infectious		1								1
German measles		1		2	6	1			5	15
Influenza					4		1		4	9
Measles		194		111	37	33	121	52	71	619
Meningitis, meningococcus					1	1			1	3
Mumps		1		14	184	33	70	33	58	393
Poliomyelitis	2	1	2	43	18	1			1	68
Scarlet fever		14	4	54	82	11	1	7	11	184
Tuberculosis (all forms)		1	18	58	45	20	9	16	45	212
Typhoid and paratyphoid fever			3	4		1			1	9
Undulant fever				4			1		1	6
Venereal diseases:										
Gonorrhea		17	26	190	131	42	24	45	73	548
Syphilis	5	12	12	90	76	15	12	9	34	265
Whooping cough		6		47	60	10	1	3	3	130

FINLAND

Notifiable diseases—September 1946.—During the month of September 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	17	Paratyphoid fever	782
Diphtheria	1,020	Poliomyelitis	30
Dysentery	20	Scarlet fever	133
Gonorrhea	1,984	Syphilis	542
Malaria	4	Typhoid fever	39

JAPAN

Notifiable diseases—4 weeks ended October 19, 1946, and for the year to date.—For the 4 weeks ended October 19, 1946, and for the year to date, cases of certain notifiable diseases were reported in Japan as follows:

Disease	4 weeks ended Oct. 19, 1946	Total cases reported for the year to date	Disease	4 weeks ended Oct. 19, 1946	Total cases reported for the year to date
Cholera	13	1,198	Paratyphoid fever	800	7,700
Diphtheria	3,820	38,658	Scarlet fever	202	1,673
Dysentery, unspecified	16,369	79,007	Smallpox	5	17,660
Encephalitis, Japanese "B"	24	[1] 164	Syphilis	7,374	55,277
Gonorrhea	11,931	98,115	Typhoid fever	3,137	38,600
Malaria	2,848	[1] 23,093	Typhus fever	45	30,753
Meningitis, epidemic	77	1,280			

[1] For the period June 2, 1946, to date.

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

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. 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

China—Chekiang Province—Wenchow.—Cholera has been reported in Wenchow, Chekiang Province, China, as follows: October 1–10, 1946, 140 cases, 14 deaths, October 11–20, 1946, 34 cases.

Plague

Bechuanaland.—Under date of November 25, 1946, 2 cases of plague with one death were reported in Sehitwa, Nganiland, and 9 deaths from plague were reported in Nokanen, Bechuanaland, up to October 22, 1946.

Ecuador—Loja Province—Celica County—Pindal.—During the month of October 1946, 13 cases of plague with 1 death were reported in Pindal, Celica County, Loja Province, Ecuador.

Smallpox

Venezuela—Sucre State.—For the period November 10–16, 1946, 395 cases of smallpox (alastrim) were reported in Casanay and vicinity, Sucre State, Venezuela.

Typhus Fever

Ecuador.—For the month of October 1946, 89 cases of typhus fever with 6 deaths were reported in Ecuador. Provinces reporting the highest incidence are: Chimborazo, 21 cases, 1 death; Bolivar, 18 cases, 1 death; Pichincha, 17 cases, 2 deaths; Azuay, 13 cases.

Mexico.—For the month of October 1946, 197 cases of typhus fever were reported in Mexico. States reporting the highest incidence are: Federal District, 49 cases, including 41 cases reported in Mexico city; Oaxaca, 35 cases; Tamaulipas, 21 cases, including 20 cases reported in Matamoros; Durango, 17 cases; Mexico, 13 cases; Nuevo Leon, 13 cases.

Peru.—For the month of September 1946, 88 cases of typhus fever were reported in Peru. Departments reporting the highest incidence are: Ancash, 18 cases; Cuzco, 15 cases; Junin, 13 cases; Cajamarca, 12 cases.

Yellow Fever

Ivory Coast—Seguela.—On November 16, 1946, one case of suspected yellow fever was reported in Seguela, Ivory Coast.

×