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CHANGES IN THE TEETH OF WHITE RATS GIVEN WATER FROM A MOTTLED ENAMEL AREA COMPARED WITH THOSE PRODUCED BY WATER CONTAINING SODIUM FLUORIDE

By W. H. SEBRELL, *Passed Assistant Surgeon*, H. T. DEAN, *Dental Surgeon*, E. ELVOVE, *Senior Chemist*, and R. P. BREAUX, *Assistant Dental Surgeon*, *National Institute of Health, United States Public Health Service*

INTRODUCTION

The manifestations of fluorosis in the incisor teeth of white rats were first described in detail by McCollum, Simmonds, Becker, and Bunting (1), although Schulz and Lamb (2), in an earlier publication, had noted an unusual overgrowth of the upper incisors of rats fed fluorine in the form of sodium fluoride. Sollman, Schettler, and Wetzel (3) studied the effect of sodium fluoride on albino rats by feeding graduated doses of 0.0002, 0.002, 0.01, 0.02, 0.04, and 0.23 per cent of the ration. They report no effect on either growth or food consumption in the rats fed the three lowest amounts. They do, however, note a progressive impairment of growth and food consumption beginning with the 0.02 per cent dose. These workers make no comment on changes in the teeth. McCollum and his associates (1) included 0.05 per cent (500 p. p. m.) of sodium fluoride in an otherwise satisfactory stock diet. Eight of the ten animals of the first generation group were carried on the fluorine diet for over 200 days. These workers noted that the orange tint seen on the anterior surface of the incisors of normal rats was generally absent. The teeth grew abnormally, the superior incisors tending in nearly every case to curve backwards forming the arc of a circle and finally penetrating the roof of the mouth. This was presumably due to the fact that they were not worn down by attrition. McCollum and associates believe these changes to be due to alteration in structure and hardness. In 1927, Bergara (4) reported that white rats on 64 milligrams of sodium fluoride per kilogram of body weight incorporated into a diet of white bread and milk showed symmetrical coffee or chocolate colored bands on both the superior and inferior incisors after about four months' feeding. The bands are not unlike those described by Chaneles (5) and Pachaly (6). Tolle and Maynard (7), in 1929, reported that rats fed rock phosphate, treble superphosphate, and sodium fluoride showed the characteristic tooth changes described by McCollum.

The most complete report in the literature on the production of experimental fluorosis in white rats is probably that of Chaneles (5). This worker studied the effect of fluorine from several different angles. His experiments included feeding (*a*) fluorine as sodium fluoride, (*b*) sodium fluoride plus ultra-violet radiation, (*c*) sodium iodide, and (*d*) sodium fluoride and sodium iodide. The fluorine dosage was 50 milligrams of sodium fluoride per kilogram of body weight, and was incorporated into a diet of white bread and milk. The histopathology of the affected teeth is reported and illustrated in detail.

In an experiment conducted by McClure and Mitchell (8) groups of three paired white rats were fed approximately 0.02, 0.06, and 0.12 per cent of sodium fluoride in the ration, and groups of four paired white rats were fed approximately 0.06 and 0.12 per cent of calcium fluoride incorporated in the basal ration. They state that no visible effects were noted in the rats receiving the 0.02 per cent of sodium fluoride, although higher levels of fluorine, both in the form of sodium fluoride and calcium fluoride, brought about changes in the teeth similar to those reported by McCollum and his associates (1). They further note that the insoluble calcium fluoride was as effective as the soluble sodium fluoride in bringing about changes in tooth structure.

The probable relationship between mottled enamel and the fluoride content of the drinking water was shown by Churchill (9). The first workers to associate experimental fluorosis in the white rat with the dental dystrophy known as mottled enamel were Smith, Lantz, and Smith (10). They report feeding rats St. David (an endemic mottled enamel area in Arizona) drinking water which had been concentrated by evaporation to one-tenth of the original volume. Seven samples of St. David water were analyzed for fluorine content and amounts varying from 3.8 to 7.1 parts per million were found. The amount of fluoride in the particular St. David water used was not stated. In another experiment they report incorporating St. David water residue directly into the ration fed the experimental animal. The amount so incorporated is not stated. At the end of a month the enamel of the teeth became dull, chalky white, and pitted. These same workers fed white rats sodium fluoride in graduated doses of 0.025, 0.05, and 0.1 per cent of the ration and observed tooth changes similar to those reported by McCollum (1). They conclude that the tooth changes produced by feeding the St. David water concentrate and the residue from the St. David water are identical with the changes produced in the teeth by the inclusion of sodium fluoride in the ration.

Velu fed white rats calcium fluoride (11) and rock phosphate (12) containing about 3 to 4 per cent of fluorine and reported the characteristic changes in the teeth described by previous workers. He (13) also reported that a similar condition was produced by feeding

groups of white rats water associated with Moroccan and Algerian rock phosphate.

Smyth and Smyth (14) report tooth changes similar to those described by McCollum and his associates (1) in white rats fed fluorine in the form of cryolite (Na_3AlF_6) and barium fluosilicate ($BaSiF_6$). The fluorine compound was mixed with the basic diet. Bethke, Kick, Hill, and Chase (15) state that fluorine added to the diet of rats results in a hypoplasia of the enamel and dentine and that the severity of the hypoplasia is proportional to the amount of fluorine ingested and the form in which it is added to the diet. In their experiments they utilized four different forms of fluorine compounds in dosages of equivalent fluorine content and found that calcium fluoride produced the least and sodium fluoride the greatest deleterious effect on the teeth. Rock phosphate and phosphatic limestone both produced an effect intermediate between that of calcium fluoride and sodium fluoride.

EXPERIMENTAL

The purpose of this experiment was to compare the changes in the teeth of white rats receiving small quantities of sodium fluoride in the drinking water with those produced by water from an endemic mottled enamel area. Conway, Horry County, S. C., is an endemic mottled enamel area of particular interest to us since a survey by Dean (16) has shown a high incidence of mottled enamel among the children using the municipal water supply during the period of calcification of their permanent teeth.

Water from the municipal water supply was shipped in 5-gallon Pyrex glass bottles to this laboratory for the experiment. A sample of this water was analyzed [1] by the methods given in the Standard Methods of Water Analysis of the American Public Health Association. The fluoride was estimated by the ferric chloride method, using a procedure similar to that used by Churchill (9). Controls were carried out with synthetic waters, which were prepared on the basis of the chemical analysis, but omitting the fluoride or adding known quantities of it. The results obtained are given in Table 1.

TABLE 1.—*Analysis of municipal water of Conway, S. C.*

	Parts per million
Residue on evaporation (180° C.)	640. 0
Loss on ignition	17. 5
Fixed residue	622. 5
Silica (SiO_2)	19. 0
Iron (Fe)	. 04
Calcium (Ca)	1. 9
Magnesium (Mg)	. 9
Sodium (Na)	250. 3

[1] Assistant Chemist C. G. Remsburg assisted in this work.

	Parts per million
Potassium (K)	5.1
Carbonate (CO_3)	20.4
Bicarbonate (HCO_3)	528.9
Sulphate (SO_4)	5.6
Nitrate (NO_3)	.4
Chloride (Cl)	48.5
Fluoride (F)	6.0

Since the etiological factor in the production of mottled enamel is apparently associated with the water supply it was decided in this experiment to incorporate the fluoride into the drinking water. The experimental animals were divided into five groups of six rats each. All received the same diet, the composition of which is given in Table 2. It is to be noted that the salt mixture used in this diet adds about 10 parts per million of fluorine to the diet.

TABLE 2.—*Composition of diet*

	Per cent
Casein, leached	20
Salt mixture [1]	4
Brewer's yeast	5
Cottonseed oil	3
Cod-liver oil	2
Cornstarch	66

The rats were kept in individual metal cages having screen bottoms of ¼-inch wire mesh. The diet was weighed and served in glass cups. About every three days the residue was weighed and the cups refilled. The drinking water was supplied in rubber-stoppered glass bottles attached to the outside of the cages, the rats having access to the water by means of glass tubes. An attempt was made to check the amount of water consumed by measuring the residue, but no accurate estimate could be made because of the inability to measure the quantity of water wasted, which in some instances represented a considerable amount.

The rats were examined carefully three times a week, and weighed once a week. The pellets of feces were counted and the consistency was noted three times a week. No evidence of diarrhea was seen in any of the experimental animals.

Group I (lot 1131) was given distilled drinking water. These animals grew normally and presented no evidence of disease. The teeth showed the orange color of normal rats. (Fig. 1.) The rate of growth is shown in Chart 1.

Group II (lot 1130) was given Conway, S. C., water which had been concentrated to one-tenth of its volume by evaporating at about 85°–90° C. These animals grew normally and the only gross pathological changes noted were in the teeth. Within 10 days from the

[1] Prepared according to Osborne and Mendel. J. Biol. Chem., vol. 37, p. 572 (1919).

beginning of the experiment the normal orange color had disappeared from the labial surfaces of the lower incisors, which appeared whitish except for an opaque orange spot at the tip of each tooth. Within the next week the lower incisors became a translucent white throughout their length. Within 52 days small brown spots appeared on the

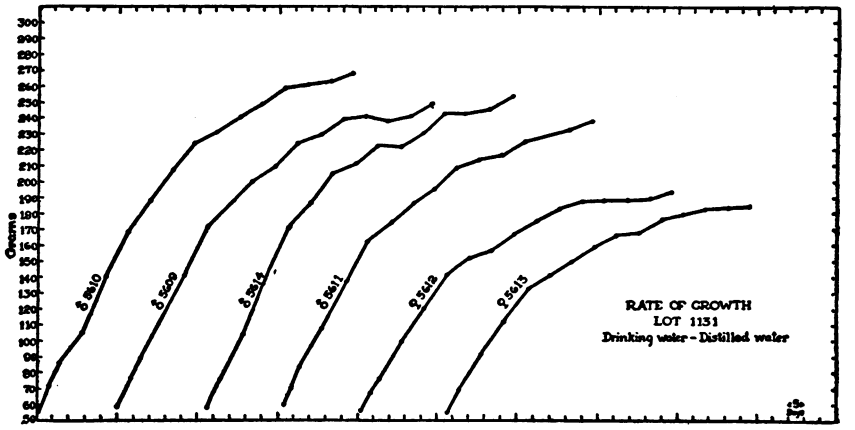

CHART 1

labial surfaces of the lower incisors. (Fig. 2.) Within 80 days these brown spots had covered the entire length of the lower incisors and assumed the appearance of closely spaced, narrow, brown, transverse striations. The rate of growth is shown in Chart 2.

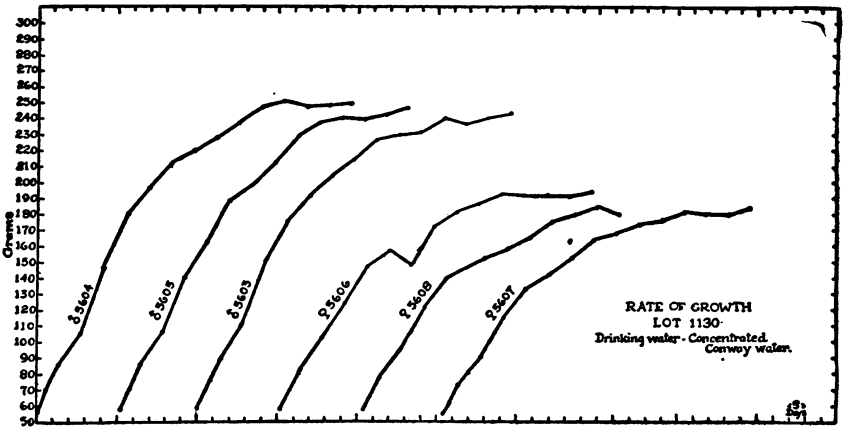

CHART 2

Group III (lot 1129) was given a synthetic drinking water comparable quantitatively to the concentrated Conway water and containing all of the ions shown by the Conway water analysis to be present in amounts greater than one-half of one part per million, with the exception of fluorine. This lot was carried in order to determine whether this mixture of mineral salts without fluorine would cause

any recognizable tooth changes. These animals grew normally and presented no evidence of disease. The teeth showed the orange color of normal rats. (Fig. 3.) The rate of growth is shown in Chart 3.

Group IV (lot 1132) was given a synthetic drinking water containing 150 parts per million of sodium fluoride in distilled water. These animals grew normally and the only gross pathological changes noted were in the teeth. The rate of growth is shown in Chart 4. The teeth showed changes similar to those appearing in the teeth of the rats on

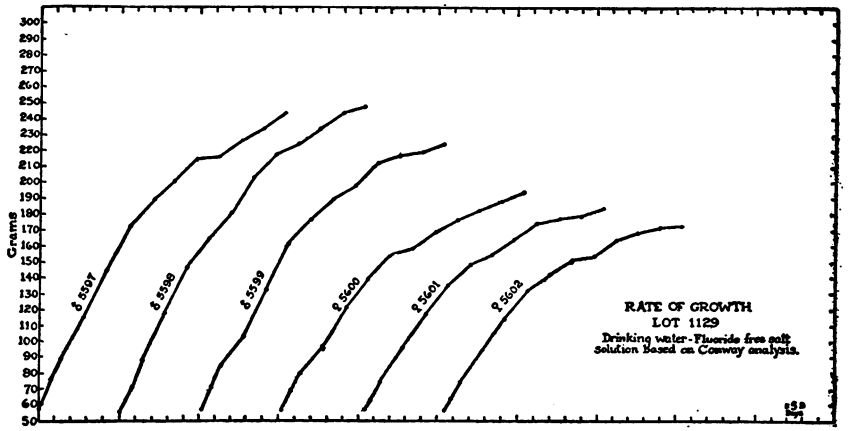

CHART 3

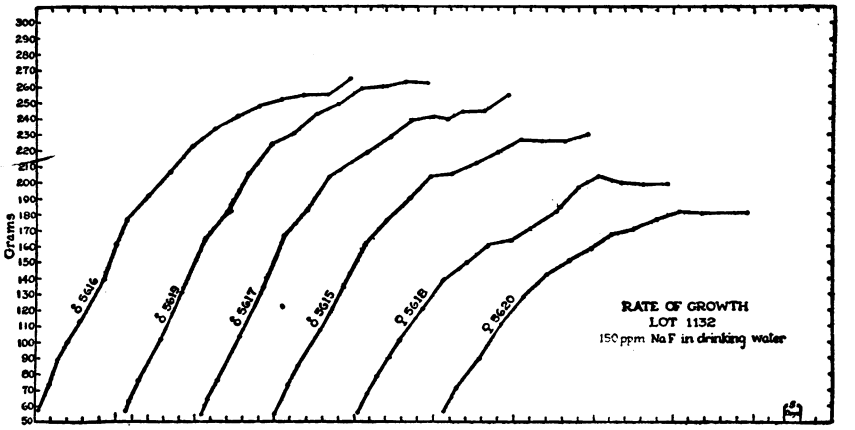

CHART 4

Conway water. Within 10 days from the beginning of the experiment the normal orange color had disappeared from the labial surfaces of the lower incisors, which appeared whitish except for an opaque orange spot at the tip of each tooth. Within the next week the lower incisors became a translucent white throughout their length. Within 52 days from the beginning of the experiment, small brown spots appeared on the labial surfaces of the lower incisors. These spots increased in size and number until they were scattered over the entire

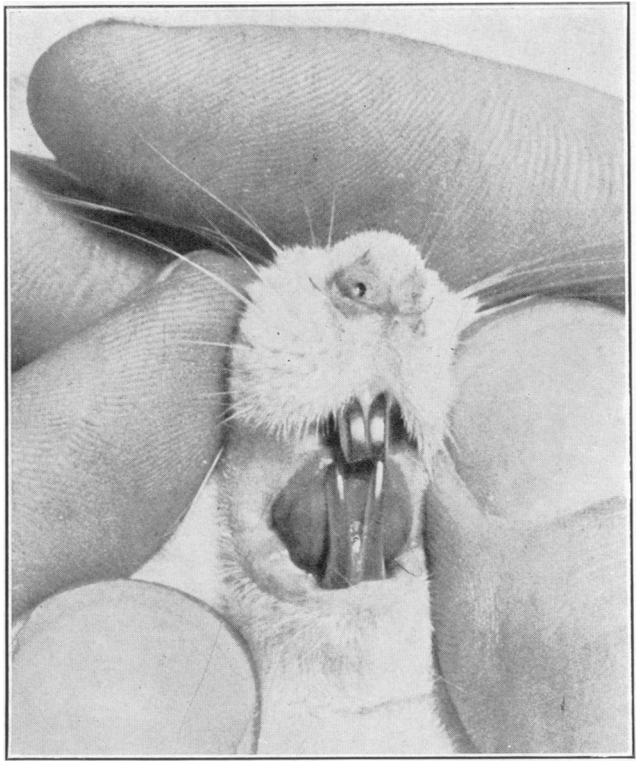

FIGURE 1.—Teeth of rat receiving distilled drinking water, showing appearance of incisors of normal rat. The apparent white spots are due to high lights

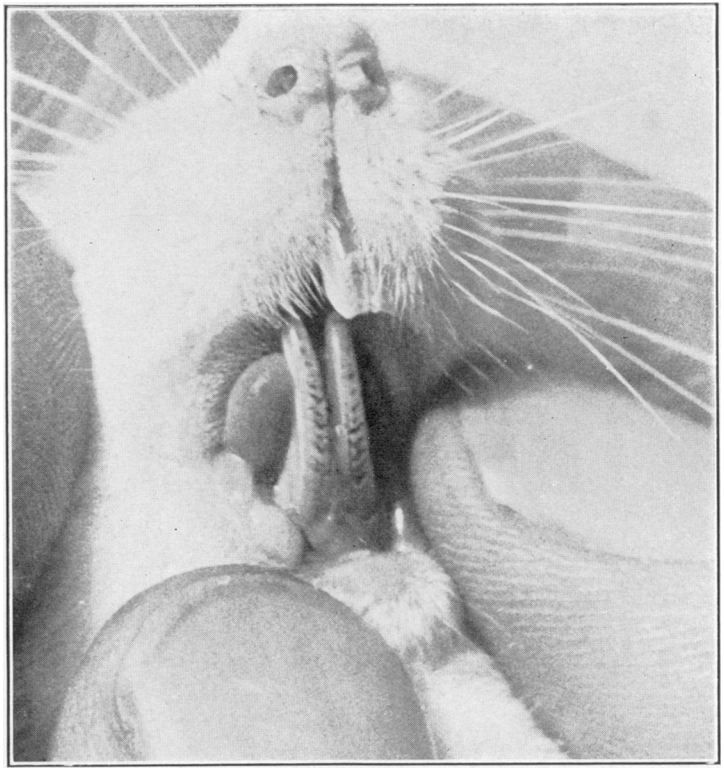

FIGURE 2.—Teeth of rat receiving concentrated Conway water, showing loss of normal color and appearance of brown spots on incisors

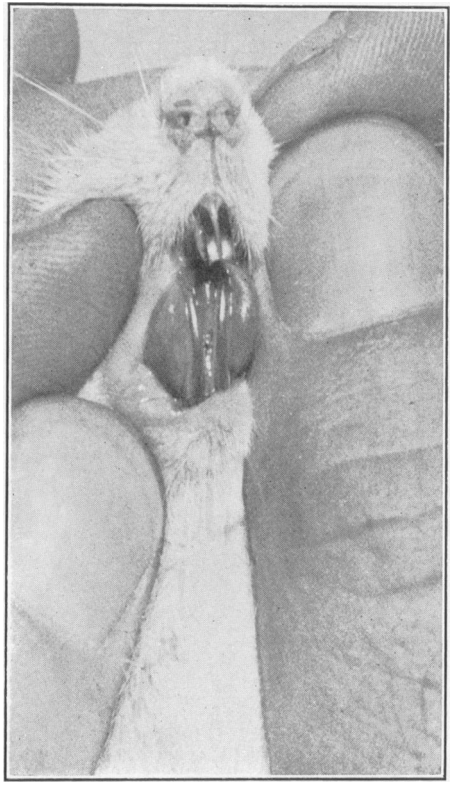

FIGURE 3.—Teeth of rat on synthetic drinking water comparable to concentrated Conway water with fluorine omitted. Teeth apparently normal. White spots due to lighting

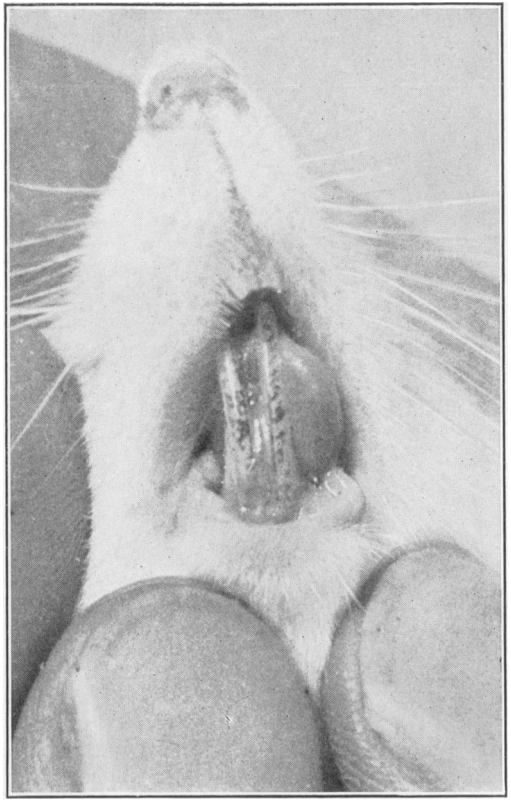

FIGURE 4.—Teeth of rat on drinking water containing 150 p.p.m. NaF, showing loss of normal color and appearance of brown spots on incisors

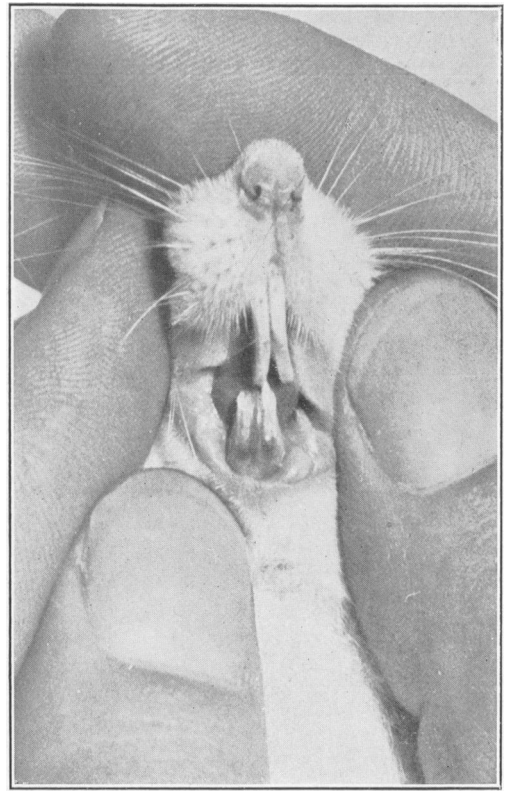

FIGURE 5.—Teeth of rat on drinking water containing 500 p.p.m. NaF, showing loss of normal color, lower incisors broken off at gingival margin, overgrowth and backward curvature of upper incisors

labial surfaces. (Fig. 4.) They appeared to differ from the lesions noted in the teeth of the rats on the Conway water only in their more irregular distribution.

Group V (lot 1128) was given distilled water containing 500 parts per million of sodium fluoride. The animals on this water gained weight for the first three days and then lost weight during the next week, followed by a rapid and continuous gain in weight, with the exception of one rat which died in 11 days from the beginning of the experiment. The remaining animals showed no gross pathological changes except in the teeth. The rate of growth is shown in Chart 5. Within 10 days the lower incisors had lost their normal orange color and were blanched except for an opaque orange spot at the incisal tip.

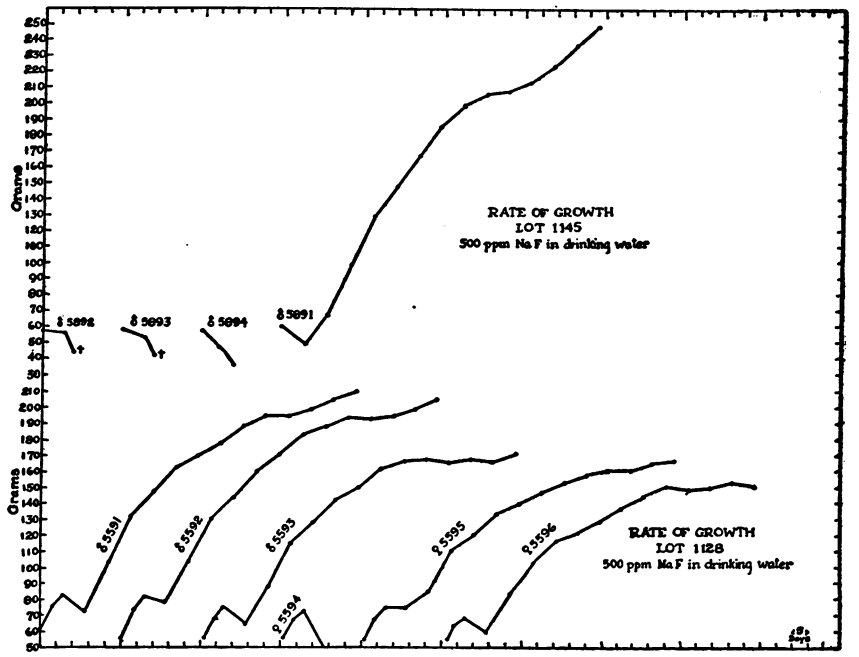

CHART 5

The teeth then gradually became chalky white and brittle. By the end of 52 days the teeth of some of the rats had broken off at the gingival margin or at the tips so that the opposing teeth, apparently because of lack of wear, became abnormally long. The upper incisors then tended to form the arc of a circle and penetrate the palate. (Fig. 5.)

An attempt was made to repeat the latter part of the experiment (i. e., with 500 p. p. m. of NaF) using a total of 20 rats. Sixteen rats died within 11 days. The four that survived the acute toxic effects of the fluorine grew well but showed the same chalky white, brittle teeth that were seen in the first group on this water. The rate of growth of one lot (lot 1145) is shown in Chart 5.

SUMMARY

A drinking water from an endemic mottled enamel area (Conway, S. C.) concentrated to one-tenth of its volume produced whitish incisors in white rats followed by the appearance of brown striations.

A synthetic drinking water comparable to the concentrated Conway water, and containing all of the ions found in the Conway water in amounts greater than one-half of one part per million excepting fluorine, did not cause any noticeable abnormality in the teeth of white rats.

A synthetic drinking water containing 150 parts per million of sodium fluoride caused a loss of the normal orange color of the incisors of white rats followed by the appearance of irregular brown spots similar to the changes produced by the Conway water.

A synthetic drinking water containing 500 parts per million of sodium fluoride was exceedingly toxic to young white rats and produced chalky white, brittle teeth in those surviving the acute toxic effect.

ACKNOWLEDGMENTS

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OBSERVATIONS ON VITAMIN A DEFICIENCY IN DOGS

By A. M. Stimson, *Medical Director*, and O. F. Hedley, *Passed Assistant Surgeon*, *United States Public Health Service*

The results of deprivation of vitamin A in dogs has been reported apparently in but few instances. Steenbock and others (1) and Mellanby (2) have described the symptoms and lesions.

It seems proper therefore to add to this literature our observations on this condition made during experiments designed to determine whether deprivation of vitamin A increased susceptibility to streptococcal infections. The experiments were inconclusive in this respect; too few of the animals in either the test or control group presented definite evidence of such infection. Indeed, the element of streptococcal infection played so unimportant a part that it is believed that, apart from the exceptions which will be noted, the material here reported represents a well-controlled experiment in avitaminosis.

METHOD

Young puppies, representing for the most part the small terrier-like breeds, and averaging about 4 pounds in weight, were obtained from dealers. Some of these were placed for a few days on a general diet before being put on a strict regimen of either the A. D. diet (vitamin A deficient) or the stock diet rich in vitamins. The dogs were kept in individual cages, excluding the possibility of communication or transfer of food. Each had its individual, tared feeding vessel with projecting base to prevent overturning, in which the

weighed food was placed once daily. The uneaten food was weighed daily and a careful record kept. The dogs were observed daily, being allowed to run about the room one at a time so that disturbances of strength, locomotion, and behavior might be noted. They were weighed once a week. Water was supplied in abundance. The feces were examined for worm eggs; and when evidence of infestation was found, capsules of oil of chenopodium and castor oil were administered.

The formulæ for the diets are as follows:

A. D. Diet (vitamin A deficient)

	Grams
Rolled oats	66
Casein (A free)	10
Salt mixture (O&M)	4
Irradiated yeast	5
Cornstarch	15
	100 (containing 379 calories).

The oats and cornstarch were cooked for 1½ hours in a double boiler with a minimum of water, cooled, and the other ingredients added. Water was then added to make up to 379 grams. Each gram of the mixture then contained 1 calorie.

The powdered yeast was irradiated by exposure in a thin layer, with stirring, to the rays of a mercury vapor quartz lamp at 14 inches distance for 20 minutes.

Stock diet

	Grams
Whole wheat flour	380
Fresh lean beef	350
Whole milk powder	60
Cod-liver oil	30
Irradiated yeast	15
Sodium chloride	6
Calcium carbonate	9
	850 (containing 2,400 calories).

The whole wheat flour was cooked in a double boiler with little water for 1½ hours, cooled, the other ingredients added, and enough water to make up to 2,400 grams. Each gram then contained 1 calorie.

The dogs were supplied with all they would eat of these mixtures.

RESULTS

This report deals with 12 dogs fed on the A. D. diet and 6 dogs fed on the stock diet.

Of the 12 test dogs, 10 developed unmistakable ocular symptoms attributable to dietary deficiency. Of the two remaining, one exhibited a transient corneal opacity during the second week of experiment, which cleared up without dietary change and was not attributed to dietary deficiency. This dog died of pneumonia in six weeks. The other dog in the series failed to develop any ophthalmia, although it lived 13 weeks on the diet.

The period at which ophthalmia developed varied greatly throughout the series, and more particularly among the different batches of dogs. The first batch of five dogs, which were fed for a few days on general diet and placed on the A. D. diet on January 15, 1932, consisted of vigorous puppies. They throve as well, in general, as the corresponding control dogs did on the stock diet for about three months. The periods at which ophthalmia developed among these five dogs were 11, 19, 20, 30, and 32 weeks, respectively.

The subsequent batches of dogs on which feeding was begun at different times from April 1 to June 17 were placed on the A. D. diet immediately on receipt and were, in general, inferior in vigor to the first batch from the start. Most of them failed to eat or gain weight well and they developed ophthalmia at periods of 6, 6, 6, 10, and 13 weeks. The two other dogs of these later batches failed to develop ophthalmia referable to vitamin deprivation, and it is possible that they did not live long enough.

It is convenient to ascribe the differences in the times of appearance of characteristic symptoms between the vigorous and puny batches to variations in the amounts of stored vitamin in their tissues. The fact that the vigorous dogs were additionally favored by a few days of general diet tends to support this view. On the other hand, the puny puppies were placed on the diet after the advent of warm weather, when all of the animals of both test and control groups showed a marked tendency to eat less and gain weight more slowly.

This failure of appetite (food consumed) was at first thought to be a premonitory symptom of the onset of ophthalmia, since it preceded it with fair regularity by about two weeks. It was found, however, that the control dogs exhibited the same symptom at about the same time.

The ophthalmia, although appearing at such varying periods, ran much the same course in all animals which developed it. After two or three days, during which an excess of secretion from the eyes might be noted, the conjunctiva would be observed to be red, swollen, and perhaps everted. At the same time, or at most within a day or two, the cornea would have a hazy or even ground-glass appearance. This condition progressed within another day or two to destructive ulceration, going on even to perforation in some instances. The condition was usually unilateral at the beginning and remained so in half of the cases, although early death may have forestalled its extension to the other eye in some instances.

A striking feature of this ophthalmia is its sudden, almost explosive development. A dog apparently in good health and spirits on one day may show a deep corneal ulcer three days later. This suggests a steep threshold for the development of the ocular symptoms and may be

taken to imply profound but undetectable physiological changes which must have gone before.

Symptoms other than the characteristic ophthalmia were inconstant and irregular among the test animals. Disturbances of locomotion, referred to by other observers, were observed in a few dogs. However, these were often transient and were matched by similar symptoms among the control animals. Convulsions, or "fits," were observed occasionally in both groups. One test dog had a tendency to carry the head to one side, which appeared to be due to weakness rather than spasm of the neck muscles; at the same time both carpal joints became subluxated due to the weight of the animal on weakened flexor muscles.

Among the puny animals especially, a tendency to upper respiratory involvement with nasal discharge was noted; but this may have been due to streptococcal inoculations.

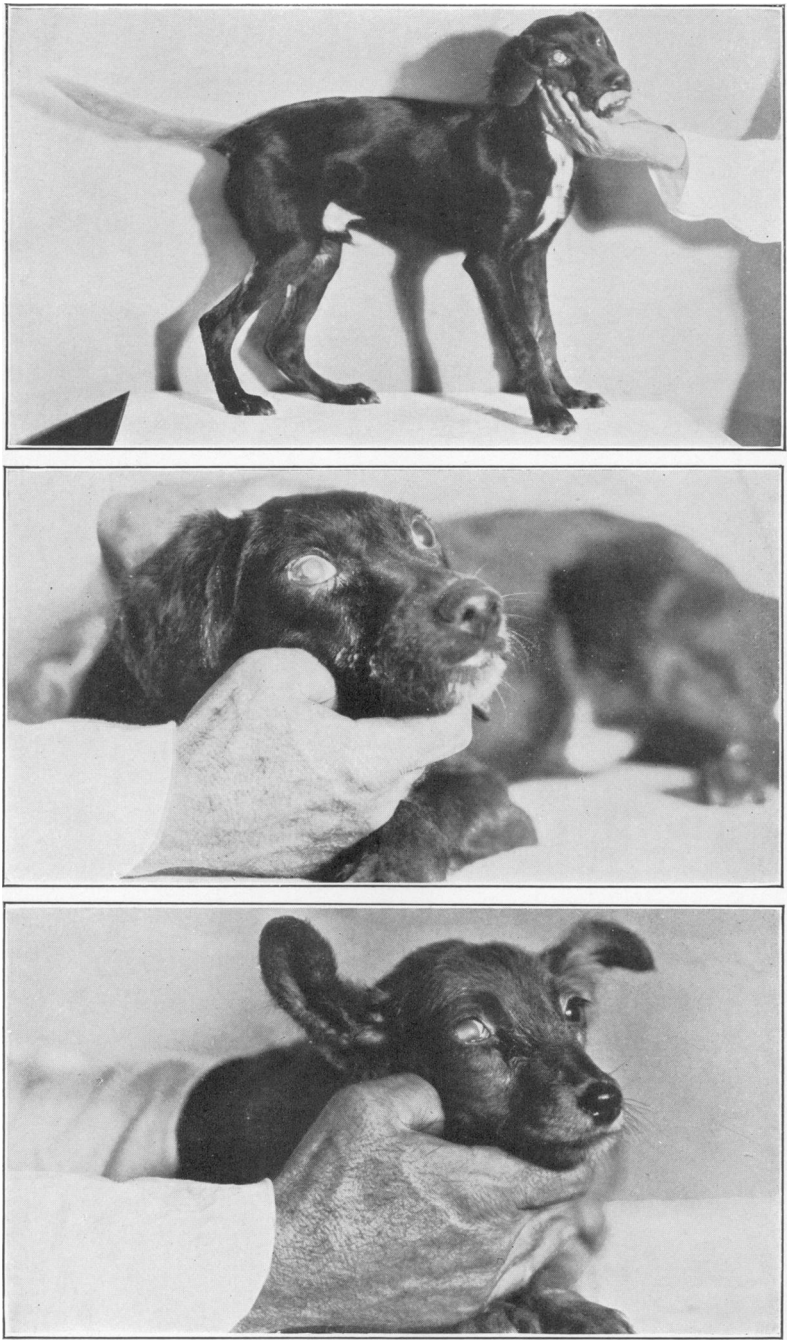
The test dogs, after a long period on the diet, frequently showed a tendency to foul mouth, not black tongue, and their teeth became covered with grayish yellow deposit about the bases. It was also noted that although the permanent teeth erupted in several animals, the corresponding deciduous teeth would remain in place alongside of them without being shed for abnormally long periods. This condition was confined to the test dogs, although the control animals also were on a soft diet affording no mechanical roughage to keep the teeth clean and to remove loosened teeth.

After the development of ophthalmia the test animals exhibited a marked falling off of appetite and condition, becoming thin and weak, their coats losing the normal luster. In a number of instances, however, marked eye lesions (Figures 1 and 2) occurred without notable impairment of the general condition.

Death occurred spontaneously in eight of the test animals, the other four being killed by gas at the end of the experiment. Death occurred in one dog from nasal hemorrhage of unexplained origin. In another, broncho-pneumonia supervened. In the remainder, necropsy failed to reveal any specific cause of death beyond malnutrition.

Only four spinal cords were examined microscopically. One of these was reported normal in appearance. The lesions in the remainder varied from slight tigrolysis in the anterior horn cells of the cervical region and moderate to marked edema of the white matter to diffuse noninflammatory degeneration of the white tracts. No consistent nervous symptoms were noted in the corresponding animals—nothing more than weakness or a tendency to be unsteady on the legs and to fall over easily.

In one animal a therapeutic test of the specificity of the eye lesions was made. After the development of opacity of the cornea on one side, cod liver oil was administered in large doses, 120 c c in 11 days.



Upper: Photograph taken during 23d week on vitamin A deficient diet. Note extensive eye involvement contrasted with very fair general condition, alertness, and glossy coat. Loss of general health followed shortly. *Center:* Same dog. Note extensive involvement of right cornea and evidence of suppuration; also beginning process in left eye, with ground glass appearance of cornea. *Lower:* Ophthalmia in a puny dog occurring during 8th week on vitamin A deficient diet. Note opacity of right cornea and discharge from that eye. Left eye not yet involved

The eye symptoms cleared up promptly and failed to recur during the life of the animal, which was terminated by gassing some five months later. This is an example of the storage power of the tissues for vitamin A.

Among the six control animals no instance of ophthalmia occurred. While convulsions and fits of excitement were occasionally noted, the animals remained generally in good condition throughout the experiment. One died spontaneously with post-mortem signs of asphyxia, without, however, any obstruction being found. The remainder of the group were killed at the end of the test and exhibited no significant pathology.

SUMMARY AND CONCLUSIONS

The effects of feeding 12 dogs on a diet markedly deficient in vitamin A have been described. These were checked by observing six dogs fed on an adequate diet. Ten of the test dogs developed characteristic ophthalmia after widely varying periods of time. Other symptoms were inconstant and inconclusive except a terminal loss of appetite, weight, and strength, frequently followed by death.

A noteworthy feature of the results was the sudden development of the ophthalmia without significant premonitory symptoms. It suggests that in A avitaminosis, profound physiological changes may occur without being detected by available means. The experiments further indicate that great individual differences exist in susceptibility to vitamin A deprivation. While this is conveniently ascribed to variations in storage of the vitamin in the tissues, other possible factors, such as general state of vigor and the influence of season, have not been ruled out.

REFERENCES

(1) Steenbock, Nelson, and Hart.: Amer. Jour. Physiol., 1921, **58**: 14.
(2) Mellanby, Edw.: Brain, Sept., 1931, *54*: 247–290.

COURT DECISION RELATING TO PUBLIC HEALTH

Compliance by municipality with State health department's order designed to correct sewage pollution of stream.—(Ohio Supreme Court; State ex rel Southard, Director of Health, *v.* City of Van Wert et al., 184 N. E. 12; decided Dec. 21, 1932.) In 1920 the then State health commissioner, with the approval of the public health council, ordered the city of Van Wert to install works and means satisfactory to him which would so dispose of the city's sewage as to correct and prevent the pollution of a certain creek. In the instant proceeding, the State health director averred that the order had not been complied with and sought a writ of mandamus to compel compliance. The city

defended on the ground that it had no funds with which to carry out the order and could not levy taxes so to do without violating certain statutory and constitutional limitations. The city also recited the fact that in this connection the voters had rejected a proposition for issuing bonds and making a levy of taxes. In holding mandatory the order of the State health authorities and sustaining a demurrer interposed to the answer filed by the city, the supreme court stated, in part, as follows:

Current expenses must be secondary to levies to meet mandatory requirements, such as discharge of bonded indebtedness, interest thereon, and also compliance with orders of the State department of health issued under general State laws, which we hold to be mandatory. If current expenses of the municipality can not be provided for within the 15-mill limitation and provision also be made for payment of bonds required to be issued in order to comply with the orders of the State department of health, then the current expenses must yield and the municipality take advantage of section 5625–15, Gen. Code, as authorized by the provisions of the constitutional amendment, sec. 2, Art. XII, to secure funds for current expenses.

That the legislature may impose upon a municipality the performance of certain duties of a public nature and require it either to raise moneys for that purpose or to devote to it revenues already on hand is well recognized. [Citations.]

For the reason that the answer does not affirmatively show that the levy necessary to pay the bonds which must be issued to comply with the order of the State board of health in financing the construction of the sewage plant, together with the mandatory levies, would result in exceeding the limitations of the constitution or of the general code, the demurrer to the second, third, and fourth defenses of the answer must be sustained.

DEATHS DURING WEEK ENDED APRIL 8, 1933

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

	Week ended Apr. 8, 1933	Corresponding week, 1932
Data from 85 large cities of the United States:		
Total deaths	8,299	8,921
Deaths per 1,000 population, annual basis	11.6	12.7
Deaths under 1 year of age	573	649
Deaths under 1 year of age per 1,000 estimated live births [1]	50	54
Deaths per 1,000 population, annual basis, first 14 weeks of year	12.2	12.7
Data from industrial insurance companies:		
Policies in force	68,561,926	73,744,524
Number of death claims	13,353	15,945
Death claims per 1,000 policies in force, annual rate	10.2	11.3
Death claims per 1,000 policies, first 14 weeks of year, annual rate	11.1	10.5

[1] 1933, 81 cities; 1932, 80 cities.

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended April 15, 1933, and April 16, 1932

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 15, 1933, and April 16, 1932

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932
New England States:								
Maine	----	2	3	22	5	208	1	0
New Hampshire	----	2	----	----	----	15	0	0
Vermont	----	----	----	----	50	39	0	0
Massachusetts	28	36	1	9	426	611	2	3
Rhode Island	4	3	----	3	----	161	0	0
Connecticut	5	8	7	17	242	156	1	1
Middle Atlantic States:								
New York	53	99	[1] 28	[1] 35	3,771	2,066	8	9
New Jersey	19	30	8	48	1,454	529	4	1
Pennsylvania	85	73	----	----	1,403	1,648	8	10
East North Central States:								
Ohio	38	64	154	193	811	2,818	1	9
Indiana	17	27	20	43	141	72	1	8
Illinois [2]	32	80	30	69	691	957	13	11
Michigan	14	26	10	32	1,363	1,754	2	9
Wisconsin	4	10	49	113	462	1,672	0	1
West North Central States:								
Minnesota	7	8	----	5	844	38	0	2
Iowa	11	6	----	----	30	2	0	0
Missouri	19	25	5	15	257	47	1	1
North Dakota	4	2	----	----	50	60	0	0
South Dakota	3	1	1	----	14	14	0	1
Nebraska	5	----	15	13	29	1	4	1
Kansas	7	9	1	6	359	460	1	3
South Atlantic States:								
Delaware	2	1	2	1	6	1	0	0
Maryland [3]	8	14	6	152	16	40	3	2
District of Columbia	5	5	2	2	8	2	2	0
Virginia	5	----	----	----	406	----	0	2
West Virginia	9	11	8	278	177	314	0	3
North Carolina [2]	9	12	11	88	653	710	0	1
South Carolina	14	8	376	1,871	288	127	0	0
Georgia [2]	8	12	90	188	128	34	2	0
Florida [2]	10	3	8	6	----	6	2	0
East South Central States:								
Kentucky	5	8	26	330	144	72	2	3
Tennessee	14	10	70	1,010	56	104	4	3
Alabama [2]	14	12	37	157	82	45	4	3
Mississippi	4	8	----	----	----	----	0	3
West South Central States:								
Arkansas	9	5	24	71	252	2	0	0
Louisiana [2]	10	31	24	13	38	103	1	0
Oklahoma [4]	6	13	34	172	95	44	2	0
Texas [2]	49	21	118	133	1,263	328	3	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 15, 1933, and April 16, 1932—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932
Mountain States:								
Montana [5]		2	6	2	39	166	0	0
Idaho [5]		1		3	20		0	0
Wyoming				2	5	6	0	0
Colorado	4	3	37		1	166	0	1
New Mexico	21	11	2	54	6	89	0	1
Arizona			5	18	66	3	1	0
Utah [3]		5			5	1	1	0
Pacific States:								
Washington	4	9		3	43	341	0	1
Oregon	1	2	44	65	76	250	0	0
California	49	80	55	88	1,220	627	1	0
Total	615	798	1,317	5,360	17,495	16,909	75	94

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932
New England States:								
Maine	0	0	24	41	0	0	1	0
New Hampshire	0	1	20	30	0	0	0	0
Vermont	0	0	14	9	0	4	0	0
Massachusetts	0	3	375	585	0	0	2	3
Rhode Island	0	0	28	68	0	0	0	0
Connecticut	0	0	140	93	0	0	0	3
Middle Atlantic States:								
New York	2	1	1,085	1,662	0	12	7	2
New Jersey	2	0	223	315	0	0	0	1
Pennsylvania	1	3	1,141	881	0	0	3	14
East North Central States:								
Ohio	3	1	1,098	490	5	17	9	7
Indiana	1	0	188	101	0	18	3	1
Illinois [3]	2	3	540	399	8	9	6	17
Michigan	0	1	617	415	2	6	7	4
Wisconsin	1	0	148	82	8	1	0	1
West North Central States:								
Minnesota	0	0	89	133	0	0	0	0
Iowa	0	0	34	66	30	44	1	5
Missouri	0	0	81	85	0	4	0	1
North Dakota	0	1	8	23	0	9	0	2
South Dakota	0	0	36	3	0	1	5	3
Nebraska	0	0	20	24	2	3	2	0
Kansas	0	0	49	46	3	5	1	4
South Atlantic States:								
Delaware	0	0	14	17	0	0	1	0
Maryland [3]	0	0	103	134	0	0	3	4
District of Columbia	0	0	15	21	0	0	0	0
Virginia	0		42		0		1	
West Virginia	0	0	12	24	0	0	5	2
North Carolina [3]	0	1	59	48	0	4	15	5
South Carolina	2	0	4	8	0	0	5	7
Georgia [3]	0	0	10	5	0	2	5	9
Florida [3]	0	0	1	1	0	0	2	2
East South Central States:								
Kentucky	0	0	36	92	0	16	3	4
Tennessee	1	0	36	32	0	10	3	7
Alabama [3]	1	1	5	13	1	15	4	8
Mississippi	0	0	6	9	0	19	7	3
West South Central States:								
Arkansas	0	0	4	7	2	25	1	1
Louisiana [3]	0	1	7	9	0	3	6	12
Oklahoma [4]	0	0	21	12	2	20	0	2
Texas [3]	1	1	64	27	20	29	9	5
Mountain States:								
Montana [5]	0	0	9	20	0	1	1	3
Idaho [5]	0	0	5	1	1	1	0	0
Wyoming	0	0	5	11	0	3	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 15, 1933, and April 16, 1932—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Apr. 15, 1933	Week ended Apr. 18, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932	Week ended Apr. 15, 1933	Week ended Apr. 16, 1932
Mountain States—Continued.								
Colorado	1	0	20	35	0	0	0	0
New Mexico	0	0	11	10	3	0	0	3
Arizona	0	0	7	7	0	0	0	0
Utah [2]	0	0	6	5	0	0	1	0
Pacific States:								
Washington	3	0	36	37	8	86	2	1
Oregon	0	0	22	12	4	28	1	4
California	3	3	157	168	32	22	3	7
Total	24	21	6,675	6,316	131	417	126	157

[1] New York City only.
[2] Typhus fever, week ended Apr. 15, 1933, 15 cases: 1 case in Illinois, 1 case in North Carolina, 4 cases in Georgia, 1 case in Florida, 6 cases in Alabama, 1 case in Louisiana, and 1 case in Texas.
[3] Week ended Friday.
[4] Figures for 1933 are exclusive of Oklahoma City and Tulsa, and for 1932 are exclusive of Tulsa only.
[5] Rocky Mountain spotted fever, week ended Apr. 15, 1933, 5 cases: 3 cases in Montana, and 2 cases in Idaho.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
March, 1933										
Arizona	4	16	23		146		0	88	1	2
District of Columbia	1	18	7		17	1	0	87	0	2
Maine	1	6	10		7		0	60	0	5
New York	12	290		5	17,492		4	4,948	0	32
North Carolina	5	64	332		2,220	28	2	198	10	15
North Dakota	7	18	44		276		0	76	7	1
Ohio	6	154	464	1	3,109		3	4,159	91	16
Wyoming		5	1		15		0	37	0	8

March, 1933

Botulism:	Cases
New York	1
Chicken pox:	
Arizona	120
District of Columbia	191
Maine	150
New York	4,845
North Carolina	922
North Dakota	69
Ohio	2,902
Wyoming	19
Diarrhea and enteritis:	
Ohio	13
Dysentery:	
Arizona	1
New York	5
Food poisoning:	
Ohio	12
German measles:	
Arizona	3
Maine	34
New York	219
North Carolina	20
Ohio	80
Lead poisoning:	
Ohio	6
Lethargic encephalitis:	
New York	17
North Dakota	1
Ohio	2

Mumps:	Cases
Arizona	138
Maine	204
North Dakota	5
Ohio	388
Wyoming	3
Ophthalmia neonatorum:	
New York	3
North Carolina	1
Ohio	86
Paratyphoid fever:	
New York	4
North Carolina	1
Ohio	1
Puerperal septicemia:	
Ohio	2
Rabies in animals:	
Maine	11
New York [1]	5
Rocky Mountain spotted fever:	
Wyoming	4
Septic sore throat:	
Maine	1
New York	38
North Carolina	15
Ohio	453
Wyoming	5

Tetanus:	Cases
New York	6
Trachoma:	
Arizona	53
North Dakota	9
Ohio	3
Trichinosis:	
New York	18
Tularaemia:	
District of Columbia	1
North Carolina	9
Undulant fever:	
Arizona	1
New York	22
North Carolina	2
North Dakota	1
Ohio	7
Vincent's angina:	
New York [1]	83
Vincent's infection:	
North Dakota	11
Whooping cough:	
Arizona	38
District of Columbia	16
Maine	82
New York	2,537
North Carolina	481
North Dakota	3
Ohio	508
Wyoming	12

[1] Exclusive of New York City.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 8, 1933

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	-------	0	0	3	1	0	1	0	8	23
New Hampshire:											
Concord	0	-------	0	0	1	2	0	1	0	0	8
Manchester	0	-------	0	0	0	2	0	0	0	0	7
Nashua	0	-------	0	3	0	3	0	0	0	0	-------
Vermont:											
Barre	0	-------	0	0	0	0	0	1	0	7	3
Burlington	0	-------	0	0	0	3	0	0	0	0	6
Massachusetts:											
Boston	4	-------	0	182	24	86	0	19	1	62	252
Fall River	0	-------	0	3	2	10	0	3	0	13	25
Springfield	1	-------	1	0	1	13	0	0	0	9	27
Worcester	0	-------	0	4	7	27	0	1	0	6	63
Rhode Island:											
Pawtucket	1	-------	0	0	0	1	0	0	0	0	-------
Providence	2	-------	0	0	4	13	0	3	0	23	65
Connecticut:											
Bridgeport	0	3	2	45	2	13	0	0	0	2	32
Hartford	0	-------	0	4	2	28	0	1	0	1	31
New Haven	0	-------	1	2	4	12	0	1	0	8	50
New York:											
Buffalo	6	-------	3	53	16	89	0	10	0	42	157
New York	78	23	12	2,400	172	421	0	74	3	104	1,591
Rochester	1	-------	1	0	5	49	0	3	0	6	82
Syracuse	0	-------	0	0	9	45	0	2	0	11	73
New Jersey:											
Camden	2	1	1	2	6	18	0	3	0	0	33
Newark	0	7	1	531	7	35	0	6	0	27	117
Trenton	0	-------	0	27	9	16	0	6	0	4	47
Pennsylvania:											
Philadelphia	6	2	2	149	43	139	0	24	0	8	490
Pittsburgh	3	5	6	1	16	57	0	7	0	27	153
Reading	0	-------	0	48	2	9	0	1	0	7	14
Scranton	0	-------	-------	1	-------	20	0	-------	0	0	-------
Ohio:											
Cincinnati	4	-------	3	11	12	41	0	10	0	0	138
Cleveland	7	50	0	2	9	259	0	13	2	23	160
Columbus	1	1	1	40	4	14	0	7	0	0	76
Toledo	5	1	0	403	4	113	0	5	0	3	63
Indiana:											
Fort Wayne	2	-------	0	0	1	14	0	0	1	0	16
Indianapolis	0	-------	1	86	14	16	0	3	0	10	-------
South Bend	0	-------	0	4	2	3	0	2	0	1	22
Terre Haute	0	-------	0	1	0	9	0	0	0	0	11
Illinois:											
Chicago	4	6	10	401	60	338	0	46	2	14	664
Cicero	1	-------	0	0	0	6	0	0	0	0	3
Springfield	1	3	0	2	1	6	0	0	0	0	15
Michigan:											
Detroit	9	3	2	634	23	207	0	12	1	123	249
Flint	0	7	0	338	1	9	0	1	0	2	23
Grand Rapids	0	-------	0	4	2	7	0	1	0	24	34
Wisconsin:											
Kenosha	0	-------	0	0	0	3	2	0	0	7	3
Madison	1	-------	-------	164	-------	1	0	-------	0	0	-------
Milwaukee	0	3	2	3	2	38	0	3	0	29	96
Racine	0	-------	0	1	1	6	0	0	0	11	11
Superior	0	-------	0	0	0	0	0	0	0	9	5
Minnesota:											
Duluth	0	-------	1	2	2	0	0	1	0	25	26
Minneapolis	1	-------	0	209	6	31	0	3	0	27	104
St. Paul	0	-------	0	825	7	19	0	1	0	92	64
Iowa:											
Des Moines	5	-------	-------	0	-------	7	0	-------	0	0	42
Sioux City	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Waterloo	0	-------	-------	0	-------	1	0	-------	0	0	-------
Missouri:											
Kansas City	1	-------	1	173	10	32	0	8	0	0	95
St. Joseph	1	-------	0	24	2	1	0	0	0	2	13
St. Louis	10	-------	1	23	6	18	0	12	0	1	171
North Dakota:											
Fargo	0	-------	0	4	0	1	0	1	0	0	5
Grand Forks	0	-------	0	0	0	5	0	0	0	0	-------

City reports for week ended April 8, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Dakota:											
Aberdeen	0			0		2	0		0	0	
Sioux Falls	0		0	3	0	0	0	0	0	0	6
Nebraska:											
Omaha	3		0	22	5	4	0	2	0	1	48
Kansas:											
Topeka											
Wichita	0		0	3	3	4	0	1	0	2	32
Delaware:											
Wilmington	0		0	4	6	8	0	2	0	3	26
Maryland:											
Baltimore	5	4	1	5	22	84	0	13	2	28	226
Cumberland	0		0	0	3	0	0	0	0	0	17
Frederick	0		0	0	0	0	0	1	0	0	5
District of Columbia:											
Washington	3		0	6	8	12	0	8	0	3	171
Virginia:											
Lynchburg	0		2	4	0	4	0	1	0	0	12
Norfolk	0		0	0	5	7	0	1	0	6	42
Richmond	1		1	2	3	6	0	5	1	0	38
Roanoke	0		0	109	0	5	0	3	0	5	22
West Virginia:											
Charleston	0		0	1	0	3	0	0	0	0	17
Huntington	1			8		3	0		0	1	
Wheeling	0		0	15	1	0	0	2	0	6	9
North Carolina:											
Raleigh											
Wilmington	0		0	185	0	1	0	1	0	0	8
Winston-Salem	2	1	0	1	3	3	0	1	0	0	9
South Carolina:											
Charleston	1	21	2	0	1	0	0	0	0	4	18
Columbia	0		1	0	4	0	0	1	0	0	17
Greenville	0		0	15	1	0	0	4	0	0	16
Georgia:											
Atlanta	1	11	0	32	9	1	0	2	0	14	94
Brunswick											
Savannah	0	28	0	0	2	1	0	1	0	0	26
Florida:											
Miami	2		0	0	0	0	0	2	0	4	34
Tampa	4	2	1	0	3	0	0	0	0	7	30
Kentucky:											
Ashland	0		0	30	0	0	0	0	0	14	
Lexington	0		0	5	4	2	0	3	0	2	16
Louisville	1	1	1	5	11	24	0	4	1	1	75
Tennessee:											
Memphis	4		0	20	9	3	0	6	0	7	60
Nashville	0		2	1	0	1	0	2	0	1	47
Alabama:											
Birmingham	1	2	3	5	3	0	0	3	1	8	73
Mobile	1		1	14	2	0	0	1	0	0	22
Montgomery	0	1		0		0	0		0	6	
Arkansas:											
Fort Smith	0			0		0	0		0	1	
Little Rock	0		0	85	1	0	0	0	0	0	
Louisiana:											
New Orleans	8	8	2	5	16	6	0	6	8	4	136
Shreveport	0		0	2	2	0	0	1	0	0	44
Oklahoma:											
Tulsa	1			36		1	5		0	5	
Texas:											
Dallas	7	3	3		4	4	0	5	0	0	54
Fort Worth	2		0	48	9	3	0	2	0	0	39
Galveston	0		0	0	1	0	0	1	0	0	17
Houston	8		1	12	12	4	2	8	1	0	84
San Antonio	2		0	9	5	3	0	5	0	0	67
Montana:											
Billings	0		0	0	0	0	0	0	0	0	8
Great Falls	0		0	6	0	4	0	2	0	13	10
Helena	0		0	0	0	0	0	0	0	0	4
Missoula	0		0	0	0	4	0	0	0	0	2
Idaho:											
Boise	0		0	24	0	0	1	0	0	0	7
Colorado:											
Denver	3	29	1	3	13	12	0	3	0	2	73
Pueblo	0		0	0	2	1	0	0	0	2	7

City reports for week ended April 8, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
New Mexico:											
Albuquerque	1		0	0	1	1	0	3	0	8	8
Utah:											
Salt Lake City	0		0	12	1	5	0	2	0	23	26
Nevada:											
Reno	0		0	0	0	1	0	0	0	0	3
Washington:											
Seattle	0			10		16	0		0	8	
Spokane	0			1		3	5		0	0	
Tacoma	1		0	1	4	12	0		1	0	32
Oregon:											
Portland	0	1	0	1	4	6	1	1	0	3	80
Salem	0			17		0	0		0	0	
California:											
Los Angeles	25	13	2	526	11	37	28	24	0	32	328
Sacramento	0		0	4	3	0	0	6	4	35	35
San Francisco	1	2	0	1	6	6	0	10	0	51	150

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
Springfield	1	0	0
Connecticut:			
Bridgeport	0	1	0
New York:			
Buffalo	2	0	0
New York	4	2	0
Ohio:			
Cleveland	1	0	0
Indiana:			
Indianapolis	2	3	0
Illinois:			
Chicago	26	7	0
Cicero	1	0	0
Springfield	2	1	0
Michigan:			
Detroit	2	2	0
Flint	0	0	1
Missouri:			
Kansas City	2	0	0
Missouri—Continued.			
St. Joseph	0	1	0
St. Louis	1	0	0
Maryland:			
Baltimore	1	0	0
Georgia:			
Atlanta	1	1	0
Tennessee:			
Memphis	2	0	0
Nashville	0	1	0
Texas:			
Dallas	1	1	0
Utah:			
Salt Lake City	1	0	0
California:			
Los Angeles	1	0	2
Sacramento	1	0	0
San Francisco	1	0	0

Lethargic encephalitis.—Cases: Providence, 1; Trenton, 1; Fargo, 1; Washington, 1.
Pellagra.—Cases: Charleston, S. C., 4; Atlanta, 1; Savannah, 4; Birmingham, 3; New Orleans, 1; Dallas, 2.
Typhus fever.—Cases: Savannah, 2.

FOREIGN AND INSULAR

ITALY

Communicable diseases—Four weeks ended September 18, 1932.—During the four weeks ended September 18, 1932, cases of certain communicable diseases were reported in Italy as follows:

Disease	Aug. 22–28		Aug. 29–Sept. 4		Sept. 5–11		Sept. 12–18	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	57	48	69	57	68	47	35	28
Cerebrospinal meningitis	7	6	16	15	4	4	7	7
Chicken pox	53	42	42	40	45	34	66	35
Diphtheria and croup	304	183	402	205	393	240	437	233
Dysentery	38	20	59	30	77	36	57	26
Lethargic encephalitis					3	3	1	1
Measles	479	166	405	163	438	156	356	128
Poliomyelitis	36	29	30	24	28	21	35	28
Scarlet fever	331	132	327	133	307	122	419	185
Typhoid fever	1,367	575	1,465	647	1,632	683	2,019	774

PANAMA CANAL ZONE

Communicable diseases—January–February, 1933.—During the months of January and February, 1933, certain communicable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities as follows:

	January		February	
	Cases	Deaths	Cases	Deaths
Chicken pox	5		19	
Diphtheria	10		7	1
Dysentery, amebic		1	10	2
Dysentery, bacillary			2	
Leprosy				2
Malaria	203	3	80	5
Measles	23		13	
Mumps	1			
Pneumonia		30		32
Poliomyelitis	1			
Tuberculosis		27		39
Typhoid fever	3	2		
Whooping cough	2		1	

SPAIN

Vital statistics—1932.—The following table shows the birth and death rates in Spain during the year 1932.

Birth rate per 1,000 population	28. 34
Death rate per 1,000 population	16. 44
Deaths under 1 year per 1,000 live births	112
Stillbirths per 100 births	3. 18

Deaths from certain diseases were reported in Spain during the year 1932 as follows:

Disease	Number of deaths	Disease	Number of deaths
Bronchitis	19,648	Scarlet fever	196
Cancer and other malignant tumors	15,797	Smallpox	7
Diarrhea and enteritis	44,744	Syphilis	634
Diphtheria	1,121	Tuberculosis, respiratory	22,173
Heart disease	47,735	Tuberculosis, other forms	5,877
Influenza	4,941	Typhoid and paratyphoid fever	3,100
Malaria	304	Typhus fever	7
Measles	3,935	Whooping cough	1,589
Nephritis	12,987	Other causes	163,157
Plague	10		
Pneumonia	39,525	Total deaths, all causes	388,895
Puerperal infections and septicemia	1,408		

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

From medical officers of the Public Health Service, American consuls, International Office of Public Hygiene, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended—													
						January, 1933			February, 1933				March, 1933				April, 1933		
						14	21	28	4	11	18	25	4	11	18	25	1	8	15
China:																			
Amoy	C	34			6														
	D	12																	
Canton	C	17		1															
Hankow	C	4																	
Hong Kong	C	2																	
Kwantung Leased Territory—District of Port Arthur	C	1																	
Macao	C	1														1			
	D	1														1			
Nanking	C	12																	
Shanghai	C	35																	
Swatow	C	30	3																
Tientsin	C	1																	
Tsingtao	C	6																	
India	C	3,626	2,411	3,453	4,524	945	971	680	800	573									
	D	2,072	1,336	1,907	2,400	504	527	330	360	288									
Bombay	C		5				1						1						
Calcutta	C	62	69	53	54	27	25	28	30	14	35	41	24	50	53	93			
Chittagong	C										1					1			
India, French: Chandenagor	C								1	2									
Indo-China (see also table below):																			
Pnom-Penh	C	5			1												1		
Saigon and Cholon	C	1	1						2								1		
Philippine Islands:																			
Cebu Province	C	1									7	8	2	2					
Iloilo Province	C	16																	
	D	11																	
Leyte Province	C	4		7	80	24		31	55	21	7	26	24	23		1	2		9

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

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended— January, 1933			February, 1933				March, 1933				April, 1933		
						14	21	28	4	11	18	25	4	11	18	25	1	8	15
Philippine Islands—Continued.																			
Leyte Province	D	2		7	44	11		20	45	14	6	23	13	21		1	2		7
Manila	C	1																	
Samar Province	C	48	53	35	135		121												
	D	38	42	26	101		75												
Siam	C	1	1		1			1	1										
Straits Settlements: Singapore	C	1																	

Place		September, 1932	October, 1932	November, 1932			December, 1932			January, 1933			February, 1933		
				1–10	11–20	21–30	1–10	11–20	21–31	1–10	11–20	21–31	1–10	11–20	21–28
Indo-China (French) (see also table above):															
Cambodia [1]	C	6	4	1			1	1	3				9		1
	D	4	3	1			1		1				6		
Cochin-China [1]	C	18	10			1	2	3	3	1	4	2	9	2	1
	D	16	7			1	2	3	1	1	1		6	2	1

[1] Reports incomplete.

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended— January, 1933			February, 1933				March, 1933				Apr. 1, 1933
						14	21	28	4	11	18	25	4	11	18	25	
Angola	C			P							P						
Argentina:																	
Cordoba Province	C				2			1		5						5	
Jujuy Province	C							10					6				
La Rioja Province	D		4														
Rosario	C															2	
Salta Province	C		7	12													
San Luis Province [2]	C			P													
Santa Fe	C				1												
Belgian Congo	C				1												
British East Africa (see also table below):																	
Tanganyika	D	10		1					2								
Uganda	C	95	192	194	141	13	18	16	11	11	7	14					
	D	91	189	169	134	13	18	16	11	10	7	14					
Ceylon: Colombo	C	5	9	11	4	3	1		1	4	1	3	2	11		1	1
	D	4	8	7	3	2			1	2	1	2	2	9		1	1
Plague-infected rats		3	5		4						3	1					
Chile: Antofagasta—Plague-infected rats		1															
Dutch East Indies:																	
Batavia	C														[3] 1		
West Java	C	418	502	610	1,152	333	362	363	271								
	D	403	502	608	745												
Ecuador. (See table below.)																	
Egypt:																	
Alexandria	C	4			2	1								1			
Assiout	C				6	1	2		1	1	2	1		4	2		2
Beheira	C	2															
Gharbieh	C	2															
Minieh	C	4	1												1	1	
France: Marseille	C				1												
Great Britain: Liverpool—Plague-infected rats		[4] 1															

[1] Including plague in the United States and its possessions.
[2] Several cases of plague with 1 death were reported at Quines, San Luis Province, Argentina, on Dec. 9, 1932.
[3] Imported.
[4] At dock where steamship City of London was berthed.

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

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended— January, 1933			February, 1933				March, 1933				Apr. 1, 1933
						14	21	28	4	11	18	25	4	11	18	25	
Hawaii Territory:																	
Hawaii Island—Hamakua—Kukaiau	C								1								
	D								1								
Plague-infected rats					2	1	1	4	1								
Paauilo—Plague-infected rats				1	11												
Maui Island—Makawao—																	
Plague-infected rats		1						1									
Omaopio—Plague-infected rats							1										
India	C	6,028	5,422	6,104	6,900	1,590	1,528	1,889	1,655	1,446							
	D	3,481	3,074	3,060	4,349	1,018	906	1,198	1,069	898							
Bassein	C	1	1						1			1	1	1	4	3	
Plague-infected rats		1	1	1	1				1	1	1						
Bombay	C	1	3									3		2	1	6	
Plague-infected rats		30	34	15	16	5	10	6	7	11	21	14	22	26	26	25	
Madras Presidency	C	343	266	546	446	132	168	113	95	95	93						
	D	153	92	197	249	48	53	35	34	43	32						
Rangoon	C		2	3	1				1		1		1	2			
Plague-infected rats		2				1					1		1	1			
Indo-China. (See table below.)																	
Iraq: Baghdad	C	1	3	1						1	1		1		1		
Madagascar. (See table below.)																	
Morocco	C			10	16							3	1	14	8	9	
Peru. (See table below.)																	
Senegal. (See table below.)																	
Siam	C	1	7	9	12	2		4	1	1	1	13	1	10	1		
South-West Africa.[5]																	
Syria: Beirut	C	4	9	12													
Union of South Africa: Orange Free State	C	P	P	P	P	1	1	1	1	1							
United States: California—San Benito County—Plague-infected ground squirrels						1											
On vessels:																	
S. S. Kingsborough at port in Argentina	C															1	
S. S. Patris at Beirut	C		3														

Place		October, 1932	November, 1932	December, 1932	January, 1933	February, 1933	March, 1933
British East Africa (see also table above): Kenya	C	7	5	8	6	11	
Ecuador	C				1		3
Indo-China	C	1	2	3	4	4	4
	D	1	2	3	2	4	4
Madagascar:							
Province—							
Ambositra	C	35	41	149	158		
	D	34	35	125	146		
Antisirabe	C	73	25	57	63		
	D	73	25	56	61		
Maevatanana	C		8	9	2		
Miarinarivo	C	19	35	37	75		
	D	19	34	36	14		
Moramanga	C	225	229	186	163		
	D	208	228	183	159		
Tamatave	C	1	1	1			1
	D	1	1	1			1
Madagascar—Continued.							
Province—Continued.							
Tananarive	C	178	209	186	198		
	D	173	199	179	190		
Peru	C		10	12	4	18	
Department—							
Ancachs	C		[6] 2				
Libertad	C	1	[6] 2				
Lima	C	5	8				
Piura	C		[6] P				
Senegal:							
Dakar [7]	C	3	6	19	2	4	1
	D	2	4	17	2	4	
Louga [7]	C	9					
	D	6					

[5] 227 cases of plague with 53 deaths were reported in Ovamboland, South-West Africa, up to Dec. 17, 1932. Antiplague measures have been taken.
[6] Suspicious cases.
[7] Incomplete reports.

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

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended—											
						January, 1933			February, 1933				March, 1933				April, 1933
						14	21	28	4	11	18	25	4	11	18	25	1	8
Algeria:																		
Algiers	C	1	2	1	1													
Constantine Department	C														1			
Arabia—Aden	C		1	3	1				2			1						
Argentina:																		
Chaco Territory	C											P						
Jujuy Province	C		1															
Belgian Congo	C			122	88													
Belgium	C		1															
Bolivia: Potosi	C				5													
Brazil:																		
Parahyba—Joao Pessoa	C			P														
Pernambuco—Recife	C		7	4														
Porto Alegre (alastrim)	C	41	26	8	16			1										
British East Africa: Tanganyika	C	65	74	66	49	42	15	36	2	18	15							
British South Africa:																		
Northern Rhodesia	C		40		6									1				
Southern Rhodesia	C	1	27	1	1	14			11	22								
Canada:																		
Alberta	C			1														
Manitoba	C		2		13													
Ontario	C			3	5									3		2		
Toronto	C			3	3													
Saskatchewan	C	6		3	1			3	2	22		9		4		10		
Ceylon: Colombo	C			28	72	14	22	12	27	18	7	5	4	1	1	1		
China:																		
Amoy	C								1	1	1	2	1	1		1		
Canton	C	2	28	180	762	189	151	101	63	85	86	41	22	26	17	10	14	
	D		2	14	23	4		7	2		1							
Chemulpo	C									17								
Dairen	C			2	1	2		2										
Foochow	C	P	P	P	P				P		P		P					
Hong Kong	C			2	18	10	22	14	32	32	28	63	46	53	43	37	36	
Macao	C				P	1		1	1	2	2	2	2	2	2	2	5	

Nanking	C	2		6	11	13	13	12			23	17	49	10				
Shanghai	C		5	13	23	14	6	12	9		17	9	2	16	7	8		
Swatow	C	1	4	8	7		10	5	7	9	8	2	2	3		9		
Chosen. (See table below.)																		
Colombia: Cali	D			1														
Dahomey	C	2	6		5	7		15		21	4	7						
Dutch East Indies	C	1	2						1									
Egypt:																		
Alexandria	C	17	23	77	583	237	231	192	327	301	300	195	147	104	82	59	32	12
	D	9	13	18	116	46	52	59	70	52	56	40	35	25	23	11	11	3
Cairo	C			1	8	4	14	14	5	6	9	9	1	7		2		
Gharbieh	C				37													
Port Said	C						1		1					1	2	3		3
Suez	C						1	1					4	1	2			
Gold Coast. (See table below.)																		
Great Britain:																		
England and Wales	C	59	116	72	79	18	16	14	18	25	20	22	9	15	23	15	18	
London	C	56	76	68	73	17	14	13	15	22	16	20	8	13	21	11	17	
London and Great Towns	C	53	110	71	76	18	16	14	18	24	20	22	9	13	22	14	17	
Greece. (See table below.)																		
Honduras:																		
Puerto Castilla	C	1		1										2				
Tegucigalpa	D																	
Tela	C	2	2	1	2		1	3		3	1	2		1	2	8	6	
India	C	3,234	4,179	7,919	11,284	3,936	4,525	5,116	6,846	6,699								
	D	722	1,013	2,239	3,523	1,098	1,376	1,451	1,982	1,906								
Bassein	C									2	1	2	2	5	2	3		
	D										1		1	1	1	1		
Bombay	C	27	33	87	230	93	199	219	294	332	408	377	405	358	341	259		
	D	20	15	35	98	49	85	97	160	164	210	206	215	286	178	142		
Calcutta	C	22	53	103	301	119	259	205	378	322	399	533	383	299	392	460		
	D	14	24	47	213	65	200	154	253	263	213	355	316	188	281	314		
Cochin	C		1											2	2			
Karachi	C	1		14	25	6	11	15	13	8	15	13	11	29	22	23		
Madras	C	89	140	119	156	55	87	102	107	117	104	130	213	153	143	195		
Moulmein	C									1								
Negapatam	C	2	3	4	2		2	1		1		1			2			
Rangoon	C	1	3	2	3	2		1	2	1	6	3	10	3	2			
Tuticorin	C	19	12	13														
Vizagapatam	C				1													
India (French): Pondichery Territory	C	13		3	2													
Indo-China (see also table below): Saigon and Cholon	C	2	1		2						2		1		4	2		
Iraq:																		
Baghdad	C	6	10	31	13	2	3	3		2	1	1		1			1	
Basra	C	33	85	81	25	1	1	1	3	2		1				1	1	
Ireland: Belfast	C											1						
	D											1						
Japan:																		
Kobe	C													1	1			
Nagoya	C											1						
Osaka	C									1	1	1		1	1		1	

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

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended— January, 1933 14	21	28	February, 1933 4	11	18	25	March, 193 4	11	18	25	April, 1933 1	8
Mexico:																		
Coahuila	C												1					
Juarez	C									3								
Mexico, D. F.	C	4	4	2		2		3	5	3	1	1						
Monterrey	C		1															
Saltillo	D		3	11	8	4				1	3			1		2		
San Luis Potosi	D		3		2													
Torreon	C	5	1															
Morocco. (See table below).																		
Nigeria	C	58	56	1,581	583	335			66		291	2	4					
Persia	C	189	404	341	216	28	29	37	14		14	6	9	4	12			
	D	94	166	150	82	14	7	18	2		3		1	1	1			
Peru. (See table below.)																		
Poland	C				1													
Portugal:																		
Lisbon	C	9	5	9	12		1	1	2	3								
Oporto	C	5	1	14	9		1	2	2	2	1	2		1		1		
Siam: Bangkok	D							1	1		1	1			2	2		
Sierra Leone	C			13	10		89		128		29							
Sudan (Anglo-Egyptian)	C		8				13		44	13	12	4	5	19	6	3	4	
Syria. (See table below.)																		
Turkey. (See table below.)																		
Union of Socialist Soviet Republics. (See table below.)																		
Union of South Africa:																		
Cape Province	C	P	P	P	P						P	P	P					
Orange Free State	C	P	P	P									P					
Transvaal	C			P	P													
Zanzibar	C										2							
On vessels.																		
S. S. Amassis at Alexandria	C					1												
S. S. British Engineer at Marseille	C			1														
S. S. Somersetshire at Suez	C						1											

S. S. British Splendour en route to Gibraltar	C			1														
S. S. Jervis Bay en route to Southampton	C			1														
	D			1														
S. S. Star of Alexandria at Alexandria	C				1													
S. S. Kohistan at Aden from Basra	C			1														
S. S. Bahadur at Madras from Calcutta	C					1												
S. S. Volturno at Alexandria	C												1					
S. S. Arimondi at Massaoua	C												2					
S. S. Hatasu at Malta	C													1				
S. S. Talma at Hong Kong	C											1						
S. S. Karapara at Rangoon	C											1						
S. S. Nawab at Rangoon	C								1									
S. S. California at Liverpool	C														1			
S. S. Kalgan at Bangkok from Swatow	C													1				

Place		September, 1932	October, 1932	November, 1932	December, 1932			January, 1933			February, 1933			March, 1933		
					1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-28	1-10	11-20	21-31
Indo-China (see also table above)	C	127	157	180	38	68	107	168	65	20	29	98	60			
	D	62	46	51	15	11	19	38	17	3	16	33	28			
Syria: Beirut	C			41	4	28	17	5	10	19	11	8		2	11	7

Place		September, 1932	October, 1932	November, 1932	December, 1932	January, 1933	February, 1933	March, 1933
Chosen	C					7	17	
Gold Coast	C		3					
Greece	C						3	55
Morocco	C	24	33	53	81	14	14	
Peru	C	166	75	67		38		

Place		September, 1932	October, 1932	November, 1932	December, 1932	January, 1933	February, 1933	March, 1933
Turkey	C	13	13			5		
	D	4	1					
Union of Socialist Soviet Republics	C	786	641					

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

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Aug. 21–Sept. 17, 1932	Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Week ended— December, 1932			January, 1933				February, 1933				March, 1933			
						17	24	31	7	14	21	28	4	11	18	25	4	11	18	25
Algeria:																				
Algiers	C	34	11	7	2						1	2	1	1			30	24	35	39
Bone	C		2			1					1			1			1			
Constantine Department	C				3					1		2		1	3	34	26	21	32	
Argentina: Buenos Aires	C	1										6								
Bolivia (see table below).																				
British East Africa: Uganda	C		16	19	16		15	2		3	8	2	4	4	4	7				
Bulgaria	C	1			12	5				2						4	5	24		
Chile (see also table below):																				
Antofagasta	C			1									1		1					
Santiago	C	22	61	41	166	45	48	78	52			84	68	47	34					
China: Hankow	C									3						5				
Colombia: Cali	D		1		1															
Egypt:																				
Alexandria	C	5							1	1										
Beheira	C		21		2								40							43
Gharbieh	C	1	1															70		
Port Said	C	1	1	1	1															
Provinces	C	6	3					33	26	28			143				134		178	
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Ireland: Belfast	C															1				
Irish Free State:																				
Cork County—																				
Bandon	C		1																	
Dublin	C		2																	
Kerry County—																				
Dingle	C	1																		
Killarney district	C			1	16	2	3													
Lithuania. (See table below.)																				
Mexico:																				
Mexico, D. F	C	10	3	11	10	2	1					2		3	6	2		5	1	
San Luis Potosi	D																			1
Torreon	C	6			2															

Morocco	C	7	2		22	17	1	9	16	10	9	14	30	4	4	66	64	11	26	
Palestine	C	6	5	2	2			1		1						1	1	1		2
Persia	C	6	16	2	11	3	4	2	7	3	3	6	4	7	13	1	19	9	4	2
Peru. (See table below.)																				
Poland	C	26	120	63	65	32	11	55	54	40	68	74	95	86	77	94	93	91	93	
	D	2	9	13	6	4		3	1	6	9	4	7	6	4	5	5	8	6	
Portugal: Oporto	C		1																	
Rumania	C	17	9	7	121	66	66	43	79	59	89	71		71	62	80				
Tunisia: Tunis	C				1		9			4	6	25		1	20	8	5	2	10	24
Turkey. (See also table below): Istanbul	C	1	1	1		1		1	1			5				1				
Union of Socialist Soviet Republics. (See table below.)																				
Union of South Africa:																				
Cape Province	C	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P			
Natal	C		P	P	P	P	P	P	P	P				P	P	P	P			
Orange Free State	C	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P			
Transvaal	C				P			P	P	P	P	P								
Yugoslavia. (See table below.)																				
On vessel: S. S. Munplace at New Orleans from Progresso	C											1								

Place		September, 1932	October, 1932	November, 1932	December, 1932	January, 1933	February, 1933	March, 1933
Bolivia	C				4	29		
Chile: Coquimbo Province	C			60				
Greece	C	15	4		15	10	2	
Guatemala	C	9			3	6	9	
Lithuania	C	5		1	10	36	13	12
Peru	C	50	81	75	111	81		
Turkey	C	6	11	15	14	23	11	
Union of Socialist Soviet Republics	C	2,639	1,727					
Yugoslavia	C			3	11	35	125	

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

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 18–Oct. 15, 1932	Oct. 16–Nov. 12, 1932	Nov. 13–Dec. 10, 1932	Dec. 11, 1932–Jan. 7, 1933	Week ended— January, 1933 14	21	28	February, 1933 4	11	18	25	March, 1933 4	11	18	25	Apr. 1, 1933
Brazil:																	
Ceara State	C	1	1	1													
	D	1															
Parahyba State	D	1															
Pernambuco State	D	1															
Piauhy State	D				1												
French West Africa: Guinea	C		2	4													
	D		2	4													
Gold Coast	C										1		1				
	D										1		1				
Guinea (Portuguese): Bissagos Islands	C					43			1								
	D					13			1								
Senegal	C		8														
	D		5														
Bakel	C	6															1
	D	5															
Dagana	C														1		
	D														1		
Podor	C															1	
Upper Gambia	C	3															
	D	2															
Sudan (French): Keyes	C		4	2													
	D		4	2													