Public Health Reports

Vol. 58 • MARCH 26, 1943 • *No. 13*

AQUEOUS-BASE YELLOW FEVER VACCINE[1]

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Man develops effective active immunity to yellow fever only as a result of infection with the virus of that disease. Such infection may occur by contraction of the disease or by vaccination with living virus. Although Finlay (*1*) in 1881 and Gorgas and Guiteras (*2*) in 1901 attempted immunization with living yellow fever virus, the first successful vaccine was that developed by Sawyer, Kitchen, and Lloyd (*3*) in 1931. The latter investigators employed Theiler's (*4*) neurotropic modification of the French strain and human immune serum. Numerous modifications of this vaccine were developed, the most extensively employed being the neutrotropic virus without immune serum prepared by Sellards and Laigret (*5, 6*) and Laigret (*7, 8, 9*) and the virus mixed with smallpox vaccine given by dermal scarification by Peltier, Durieux, Jonchere, and Arquie (*10, 11*). The next advance was the substitution of a less virulent virus strain grown in mouse embryo tissue culture by Lloyd, Theiler, and Ricci (*12*). A yet more attenuated virus, known as the 17 D strain, was brought out by Theiler and Smith (*13*) and first employed for human immunization in 1936. Vaccine prepared with the 17 D virus consisted of an extract of infected chick embryos in nonimmune human serum (*14, 15*). It may be designated "17 D serum-base" vaccine. An experience of 6 years with this vaccine, involving more than 2,000,000 vaccinations, has demonstrated the superiority of the 17 D strain for human immunization (*14, 15, 16, 17, 18, 19, 20, 21*).

The elimination of serum from the 17 D serum-base vaccine and utilization of the infected embryo extract alone was advocated by one of us (M. V. H.) early in 1939. Such a vaccine was prepared and used in Brazil in December 1940, as reported by Fox, Manso,

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Penna, and Madureira Para (*22*). This modified vaccine, without serum, may be designated "17 D aqueous-base" vaccine. The serum-base product continued to be generally employed while studies of the aqueous-base preparation were under way.

The preparation of yellow fever vaccine was initiated by the United States Public Health Service in February 1941, in a unit established at its Rocky Mountain Laboratory. The making of 17 D aqueous-base vaccine was undertaken at that time with seed virus kindly supplied by J. H. Bauer of the Rockefeller Foundation. Studies were pursued to determine the best method of preparing, preserving, and administering this simplified product. Human vaccination was first accomplished in July of the same year. A field study of the comparative behavior of serum-base and aqueous-base 17 D vaccines was then undertaken at Oroya, Peru, under the auspices of the Pan-American Sanitary Bureau. Two hundred and three persons, nonimmune to yellow fever,[2] were vaccinated, 102 with a 17 D serum-base preparation and the remainder with a 17 D aqueous-base vaccine. None developed untoward reactions. Unfortunately, postvaccination serum specimens could be obtained from only 13 of the first group and 9 of the second. These 22 serums were subjected to the virus neutralization test and all showed immune bodies present.

An additional 19 persons, presumably nonimmune, who received the aqueous-base vaccine at various times at Hamilton, Mont., were all subsequently shown to possess neutralizing bodies. Meanwhile, soldiers of the United States Army, in considerable numbers, were found to be developing acute hepatitis following vaccination with certain 17 D serum-base vaccine preparations (*24*). Foregoing further field trials, the production of the aqueous-base vaccine was increased in the first semester of 1942 and released for general use.

PREPARATION AND PRESERVATION

The 17 D aqueous-base vaccine, as prepared by the United States Public Health Service, is a distilled water extract of 10- to 11-day-old infected chick embryos which is preserved by desiccation and storage at subfreezing temperatures. Fresh, fertile eggs are incubated, as for hatching, for 7 days. Those eggs showing viable embryos are then each inoculated with 0.05 ml. of 227th to 230th passage 17 D virus via a small hole drilled through the shell in the center of the larger end. Egg passage rather than tissue culture propagated virus is employed. It is unimportant whether the virus is deposited within or only near the embryo. After sealing the inoculation holes with hot wax, the eggs are returned to incubation as

[2] Blood was drawn just prior to vaccination and later tested by the protection test method of Sawyer and Lloyd (*25*) for the determination of immune bodies.

before for a further 90 to 96 hours. The eggs are then opened, the living embryos freed of attached membranes and deposited in a homogenizer. Dead embryos are discarded. For each three grams of embryo there is added 1.0 ml. of distilled water. This added water serves to reduce the viscosity of the resulting extract and aids in rupture of tissue cells by alteration of the osmotic pressure. The embryo-water mixture is then homogenized for 10 minutes, being kept cool with a pack of dry ice about the container. Next the suspension is centrifuged for 30 minutes at 3,500 r. p. m. and the supernatant drawn off while the sediment is discarded. Specimens are taken for sterility and virus concentration determinations; the remainder of the extract is run into a 1-liter pyrex bottle and frozen into a thin-walled, hollow cylinder by rotating in an alcohol-dry ice bath. The term "shelling" has been applied to this method of freezing. The frozen extract is stored at minus 60° to 78° C. pending distribution into ampoules. Extract showing contamination or a virus concentration of less than 25,000, as determined by the method of Reed and Muench (*25*), is discarded.

One to six bottles of extract (generally 300 to 500 ml. per bottle), free of contamination and of adequate titer, are then melted in water at 37° C., pooled, and distributed in quantities of 1.0 and 5.0 ml. into specially designed pyrex glass ampoules of 6.5 ml. and 28.0 ml. capacity, respectively. With extract of a titer of 200,000 or more, only half quantities may be distributed. The vaccine is next shelled in a cold alcohol bath at a temperature of minus 60° to 70° C., utilizing a special machine designed for the purpose. It is then temporarily stored at minus 22° C. pending initiation of desiccation one-half to two hours later.

The vaccine is dried under high vacuum from the frozen state, employing a "lyophile" type desiccator patterned after the apparatus described by Bauer and Pickels (*26*). Desiccation lasts 21 hours with the vaccine held at minus 22° C. for approximately the first 10 hours. The temperature is then slowly elevated to 24° C. at which level it is maintained during the terminal 1 to 2 hours. The vacuum is 1 to 2 microns at completion of drying. The desiccation system is then filled with dry (oil pumped) nitrogen to atmospheric pressure and the ampoules promptly sealed.

A rigid aseptic technique is depended on to insure freedom from contaminants. Approximately 10 percent of embryo extract lots are discarded due to actual or suspected contamination. Extraneous organisms have been encountered in less than 2 percent of desiccated lots.

Following desiccation the ampoules are inspected as to content and container defects, labeled, inspected again, packed in boxes, and stored at a temperature of minus 16° to minus 30° C.

Each lot of vaccine is subjected to the following series of rigid control tests before being considered for human use:

1. Cultures are made using dextrose broth, both aerobic and anaerobic tubes, Brewer's or Linden's thioglycollate media, and chocolate agar slants to detect contaminants.
2. Three guinea pigs [3] are each injected intraperitoneally with 3.0 ml. of vaccine to detect organisms which might fail to develop in the media. In case one or more of the guinea pigs become ill from nonrelated intercurrent disease, a substitute series is inoculated.
3. Virus content is determined by inoculation of decimal dilutions into white Swiss mice and calculated by the 50 percent end-point method of Reed and Muench (*25*).
4. A healthy rhesus monkey, previously shown by protection test not to harbor yellow fever antibodies, is bled and immediately thereafter inoculated intracerebrally with vaccine from a single lot. One-quarter milliliter of a 1:5 dilution is injected into the right frontal lobe. The animal is bled on the second, third, and fourth days following inoculation to determine the presence of circulating virus as described by Theiler and Smith (*13*). Fourteen days following injection of vaccine the monkey is bled again and serum from both pre- and 14-day post-inoculation bleedings placed in the same virus neutralization test "run" for determination of virus neutralizing bodies. Each test monkey is observed for approximately 1 month.

To be accepted for human use a lot of vaccine must conform to the following requirements:

1. Sterility cultures must show no growth.
2. None of a series of three guinea pigs inoculated intraperitoneally may show illness or a temperature of more than 39.7° C. during the 2 weeks immediately following injection.
3. A minimum of 66,000 minimum lethal mouse doses of virus per milliliter must be present.
4. The test monkey must show circulating virus and a reversal of protection test; i. e., the preinoculation serum specimen must show virus neutralizing bodies absent, and the postvaccination specimen show them present. The animal must recover from any illness incurred, without signs of paralysis having developed at any time. The vaccine is discarded if the test monkey develops paralysis or dies, regardless of apparent cause.

In a consecutive series of 60 monkeys inoculated as described, 50 developed fever (40° C. and more) and 10 did not. Of those which

[3] Guinea pigs do not develop fever or become ill as a result of intraperitoneal inoculation of 17 D strain yellow fever virus.

showed fever the average onset was 9 days following injection and the duration 2 days. An occasional monkey, apparently hypersusceptible to 17 D virus, will develop severe encephalitis, frequently with paralysis. Sometimes the encephalitis causes death.

Rate of virus loss varies greatly with different lots of similarly prepared and stored vaccine. Kept at minus 16° to 30° C., an occasional preparation will lose 75 percent or more virus within 3 months, while another will show no loss after 10 months. Suspended in 10 parts of physiological saline at 37° C. for 1 hour, 7 aqueous-base lots showed an average loss of 25.7 percent of virus. A serum-base (36 percent embryo in human serum) preparation exposed 2 hours under like conditions showed a 24.3 percent average loss. Of 20 consecutive vaccine lots prepared in this laboratory and found suitable for human use, one-half of which were prepared by the serum-base method and the remainder by the aqueous-base technique, the average virus content at termination of desiccation for the serum product (average embryo content 29.8 percent) was 994,433 minimum lethal mouse doses per milliliter, and for the aqueous preparation, 4,397,667 doses.

Refrigeration during transit is obtained by packing in carbon dioxide ice within a glass vacuum flask, such as is commercially available. Utilizing a 12-quart flask, refrigeration can be maintained for a week with the container exposed to a temperature of 100° F.

IMMUNIZATION

Instructions accompanying each release of vaccine direct that it be kept at a below-freezing temperature until actual time of use. Following removal from refrigeration, it is rehydrated to original volume with physiological salt solution and then diluted 1:10 with additional saline. It must be well agitated in order to secure a complete and uniform suspension. Each recipient is given 0.5 ml. subcutaneously. The vaccine must be used within 1 hour following rehydration to avoid possibility of inoculating subpotent material. There are no contraindications to vaccination of persons subject to exposure, regardless of age,[4] provided the subject is in a generally fair state of health. Children receive the same dose as adults.

Reactions at site of inoculation have not been observed. An expected mild type of discomfort, characterized by headache, fever, backache, and malaise similar to that described by Soper and Smith (*16*), occasionally develops. The occurrence of postvaccinal jaundice, such as encountered in 1942 among United States Army troops (*24*) who received 17 D serum-base vaccine, has to date not been reported. No reactions of an anaphylactic type have been noted. Studies by Berge and Hargett (*27*) have shown that sensitization

[4] The Yellow Fever Vaccination Service, as carried out in Brazil, recommends mass vaccination of all individuals over 1 year of age. (Personal communication from Dr. W. A. Sawyer.)

with this preparation is unlikely as long as 11-day-old or younger embryos are employed in preparing the vaccine. Fox, Lennette, Manso, and Souza Aguiar (*28*) have reported cases of encephalitis (under 1 percent) among more than 100,000 persons inoculated with 17 D aqueous-base vaccine in South America. They believed this to be the result of utilizing a 17 D substrain which had assumed increased neurotropic characteristics. They further reported that encephalitis was not observed with the same vaccine employed in a far distant territory. No unfavorable reactions have been encountered among persons vaccinated with the more than 600,000 doses of aqueous-base vaccine released to date by the United States Public Health Service.

The limited studies made in Peru and at Hamilton, Mont., indicate that the aqueous-base vaccine compares well with the serum-containing product in promoting the formation of immune bodies. Smith, Penna, and Paoliello (*15*), Fox and Cabral (*20*), and Smith, Roca Garcia, Gast Galvis, and Calderon Cuervo (*21*) have reported that approximately 95 percent of persons inoculated with the serum-base preparation developed demonstrable virus neutralizing bodies. This result should be equalled and possibly exceeded with the water-base vaccine, since the same virus strain is employed with the quantity of virus inoculated per recipient generally considerably greater with the aqueous-base product.

The question of when to revaccinate remains to be determined. The studies of Fox and Cabral (*20*), relating to the serum-base vaccine, indicate that immunity from the group standpoint is maintained for at least 4 years. This period will likely be extended as opportunity for more prolonged observation is afforded.

COMMENT

Studies of a more comprehensive nature must be carried out before a full comparison may be made relative to the merits of the aqueous-base vaccine as contrasted with the serum-base product. It would seem, however, that adequate experience has been provided to permit the formulation of preliminary conclusions.

Preparation of the modified vaccine is simplified by elimination of the serum. The possibility of picking up a pathogenic contaminant from the serum diluent is absent. Although virus inactivation is more rapid with the aqueous-base preparation diluted for administration, this is more than compensated by the higher concentration of virus. The serum product contained only 10 to 40 percent virus infected chick extract compared with 75 percent for the aqueous preparation. Although the water-base product contains an increased quantity of chick embryo protein, anaphylactic reactions have not

been observed. The only untoward reactions reported among the considerable number inoculated with the water-base vaccine have been those cases of encephalitis, already referred to (*28*), in the state of Minas Gerais, Brazil. It does not appear likely that these were the result of method of preparation. While determinations relative to immunity established are few,[5] they compare favorably with the more extensive studies (*15*, *20*, *21*) that have been made following vaccination with the 17 D serum-base preparation.

SUMMARY

The preparation of *aqueous-base* living yellow fever vaccine was undertaken by the United States Public Health Service in 1941. This vaccine is an aqueous extract of 10- to 11-day-old chick embryos infected with the attenuated 17 D strain of yellow fever virus. It differs from the 17 D *serum-base* vaccine extensively used in recent years in that it contains 75 percent, rather than 10 to 40 percent, embryo extract and no serum diluent. The extract is preserved by desiccation under high vacuum from the frozen state, with storage at subfreezing temperatures in an atmosphere of dry nitrogen. For administration the dried preparation is rehydrated and diluted 1:10 with physiological saline, with each recipient receiving 0.5 ml. subcutaneously.

The increased virus content of the aqueous product as contrasted with the serum-containing preparation insures that a greater quantity of virus is inoculated per individual vaccinated. This favors host immunization.

In excess of 600,000 doses of the aqueous type vaccine have been released to date for general use without encountering unfavorable reactions. Of 28 individuals studied, all possessed specific virus neutralizing bodies several weeks following vaccination.

Danger of vaccine contamination by serum containing pathogenic agents is eliminated.

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[5] In June 1942, at about the time the employment of aqueous-base vaccine was generally initiated in the United States, official regulations were issued directing that only persons leaving for yellow fever areas be vaccinated.

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EXPERIMENTAL CHEMOTHERAPY OF BURNS AND SHOCK

III. EFFECTS OF SYSTEMIC THERAPY ON EARLY MORTALITY [1] [2]

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In a previous communication (*1*) a method was described for the production of standardized burns in mice, and the effects of local therapy on the mortality during the first 72 hours were reported. The present paper deals with the results obtained from some of the agents commonly employed in the systemic treatment of shock.

METHODS

The technique for the production of burns has been previously outlined (*1*). Shaved, etherized female mice [3] are immersed in a water bath at 70° C. for a measured period of seconds. The foregoing work dealt chiefly with procedures that increased the mortality rate, and a control group in which mortality was 40 to 60 percent within 3 days was employed in order to bring out these increases. In the present studies, where substantial reductions in mortality as a result of therapy were obtained, it was advantageous to secure a control mortality of 80 to 100 percent. This was brought about by lengthening the time of immersion from 4 to 4½ or 5 seconds, and by employing smaller mice (15 to 20 grams). Under these conditions nearly all of the early deaths occurred within the first 24 hours, the majority occurring within the first 12 hours. After the first day the surviving mice had largely recovered from the prostration, dyspnoea, and other visible signs of shock; deaths occurred among these survivors from the third day onward, with histological evidence of toxemia and secondary infection. The present study is concerned only with early mortality, and therapy has been limited to the first 7 hours following the burn. The majority of animals that survived the early period as a result of therapy died in from 3 days to 3 weeks; attempts to influence the mortality during this delayed phase will be the subject of later study.

In this paper, for purposes of brevity, the mortality curves will be shown only for the first 2 days subsequent to the burns. Unless otherwise specified each curve represents 15 mice. Therapy was administered within an hour following the burn, and in some cases repeated at the third and seventh hours. Where comparison was made of hypertonic solutions by mouth, drinking water was withheld from all mice for 7 hours.

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

[2] The first paper in this series is: Experimental chemotherapy of burns and shock. I. Methods. II. Effect of local therapy. Pub. Health Rep., 57: 1923-35 (1942).

[3] The diet of these mice consisted of pellets, the composition of which has been previously stated (Pub Health Rep. 56: 1880 (1941)).

EPINEPHRINE AND POSTERIOR PITUITARY EXTRACT

Epinephrine.—Subcutaneous administration of epinephrine in peanut oil was used in order to obtain a prolonged effect. The maximum tolerated dose for normal mice was found to be approximately 0.05 mg. per 20 gm. mouse (L. $D._{50}$=3.25 mg. per kg. of body weight). The 0.2 percent suspension of epinephrine in oil was diluted in peanut oil so that the volume injected was 0.02 to 0.04 cc. Control animals received similar quantities of oil alone.

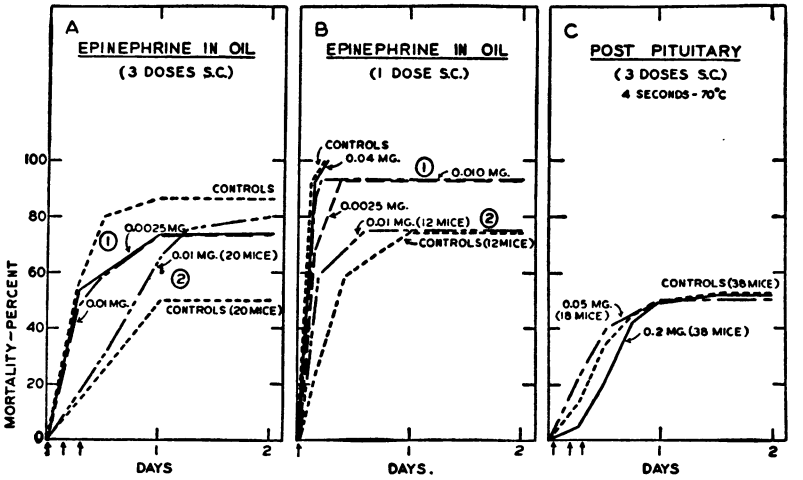

FIGURE 1.—Absence of effect of epinephrine and posterior pituitary extract on the acute mortality of burned mice. (A) In experiment A 1, mice immersed in water at 70° C. for 4½ seconds; in A 2, for 4 seconds. Three doses S. C. at 1, 4, and 7 hours, with amounts at each injection shown on chart. (B) In B 1, mice immersed for 4½ seconds; in B 2, 30 gm. mice immersed for 4 seconds. One dose of epinephrine shortly after burn. (C) Composite of two experiments with posterior pituitary. Mice immersed for 4 seconds. All subsequent curves represent 15 mice of 15 to 20 grams unless otherwise specified.

Four experiments, under conditions of high or low mortality among the control mice, and with single or multiple doses of epinephrine, revealed no effect from this treatment (fig. 1 A and B).

The use of epinephrine in shock is a controversial subject although the majority of investigators believe it to be of no benefit (*2*). Kabat and Freedman (*3*) have recently reported prolongation of life from its use in experimental traumatic shock in cats.

Posterior pituitary.—Solutions were made from the United States Pharmacopoea standard powder. Subcutaneously the toxicity to mice was low, 2 mg. per mouse (0.1 gm. per kg.) causing only transitory dyspnea. The volume of solution injected following burns was 0.02 cc., and like amounts of saline were given the controls. Three doses of 0.05 to 0.2 mg. per mouse had no effect on the mortality rate. Two experiments gave similar results and are combined in figure 1 C.

The absence of effects from epinephrine and posterior pituitary extract when administered systemically suggests that the beneficial

action obtained from local application in saline solutions (*1*) was due to local vasoconstriction which could either inhibit the degree of exudation or retard the absorption of toxic substances from the burned area.

ADRENAL CORTICAL HORMONES

Studies were carried out with subcutaneous administration of desoxycorticosterone acetate in sesame oil and with an aqueous extract ("Eschatin") containing 25 dog units per cc. Control animals were given similar amounts of either sesame oil or saline. Injections were given within 1 hour and at 3 and 7 hours after the burn. It was found that the saline brought about a significant reduction in mortality so that an additional control group without saline was required.

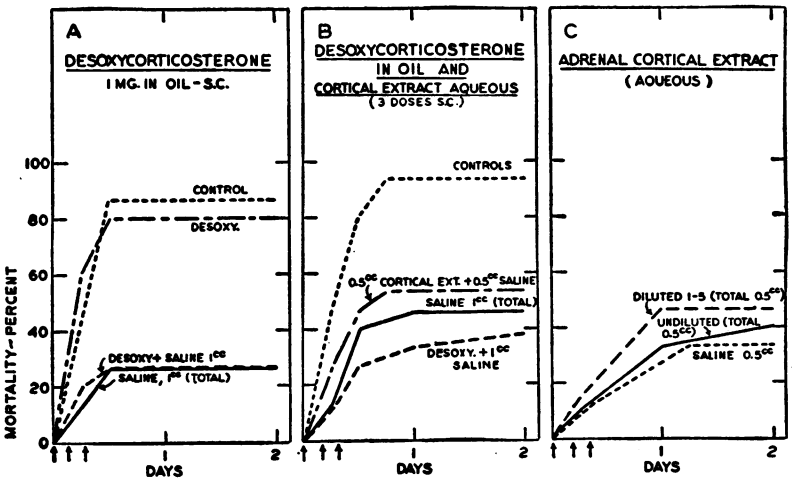

FIGURE 2.—Lack of effect of adrenal cortical hormones, alone or with saline, given S. C. within 1 hour after burns and repeated in 4 and 7 hours. In A and B, immersion for 4½ seconds; in C, for 4 seconds. No controls without saline used in C.

It is seen from figure 2 that no effect on the mortality curves was obtained from these hormones. The aqueous extract (containing 0.8 percent saline) gave values similar to saline alone, while the corticosterone in oil, alone or with saline, resulted in mortality rates similar to those with control oil or with saline alone. Total amounts of 0.1 to 0.5 cc. of the aqueous extract and of 1 mg. of the corticosterone divided into 3 doses were used.

Cortical hormones in the hands of previous investigators have afforded protection in experimental shock of various types (*4*, *5*, *6*, *7*). Such results have been obtained largely from prophylactic doses administered some hours before the trauma, although Perla and associates (*8*) report some therapeutic effect from an aqueous extract in

histamine shock in mice and rats. Further studies are required to determine whether a prophylactic effect can be obtained under the conditions of our experiments, or whether the intravenous administration of the aqueous extract will possess some action.[4]

SODIUM CHLORIDE

The ability of NaCl to reduce the early mortality from burns has been subjected to detailed study. It was found that oral or intraperitoneal administration is more effective than intravenous. Among 45 mice in each group the mortality following 1 cc. by mouth was 46.6 percent in 1 day and 48.8 percent in 2 days as compared with

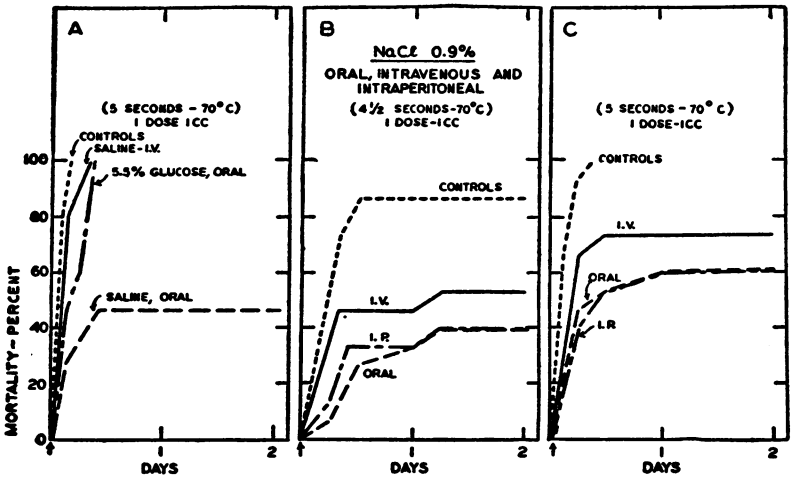

FIGURE 3.—Comparison of action of 0.9 percent NaCl administered orally, intravenously, and subcutaneously. One cc. given within an hour after the burn.

73.3 and 75.5 percent respectively, with intravenous injections (Difference=26.7 percent. P. E. Diff.=± 6.6) and 95.5 percent among the controls (fig. 3). Two oral doses of 1 cc. of 0.9 percent NaCl given by mouth within 1 hour and at 4 hours after the burn to 45 mice gave a mortality of 13.3 percent in 1 day and 17.7 percent in 2 days, as compared with 93.3 percent among 45 controls (fig. 4 A, B, and C). One oral dose of 1 cc. given within an hour after the burn to 150 mice gave a mortality of 34.3 percent in 1 day and 36 percent in 2 days as compared to 92 percent in 1 and 2 days for 150 controls. In two experiments not shown in the charts a total of 3.5 cc. of 0.9 percent NaCl intraperitoneally in 3 doses at 1, 4, and 7 hours after the burn gave, in 30 mice, no mortality in 1 day and 3.3 percent in 2 days, as compared to 80 percent the first day and 83.3 percent the second day among 30 controls.

[4] Later studies revealed no effects from "Eschatin" and from cortical extract (Wilson) given in 0.25 cc. prophylactic doses at 18 hours and at 1 hour preceding the burn.

For a period of hours after the burn the treated animals exhibited a degree of prostration and dyspnea hardly distinguishable from the controls. Recovery occurred from a state presenting all of the symptomatic manifestations of shock.

It was also found that with oral administration isotonic solutions were superior to hypertonic. The same amount of NaCl per mouse (9 mg.) was more effective when given in 1 cc. of water than when given in 0.1, 0.2, or 0.4 cc. Furthermore, 1 cc. of 0.9 percent NaCl was superior to 1 cc. of 4.5 percent (fig. 4 A, B, and C). These results were to be expected since hypertonic solutions by mouth may cause an initial increase in hemoconcentration.

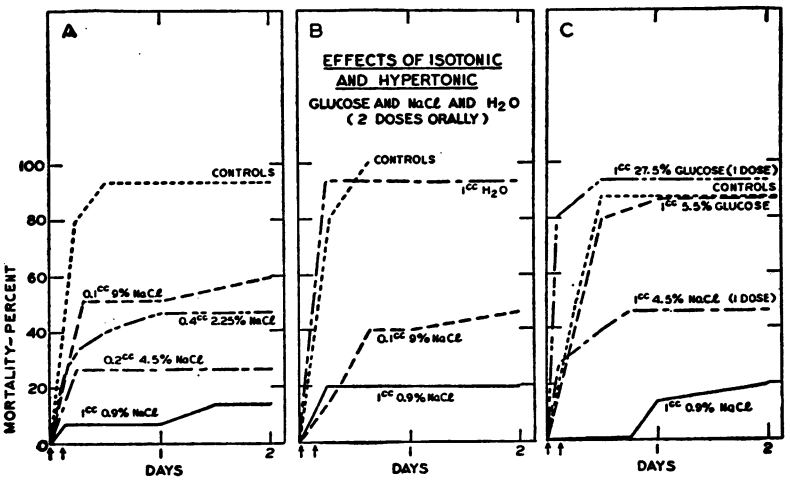

FIGURE 4.—The superiority of isotonic to hypertonic NaCl orally. Lack of benefit from water and glucose orally. Immersion for 4½ seconds in all cases.

WATER, GLUCOSE, KCl, AND CALCIUM

Water.—Two doses of 1 cc. of water orally were without benefit, if not actually deleterious. The average survival time of the 14 out of 15 mice that succumbed was 4.6 hours (S. D. = ± 1.095) as compared to 7.2 hours (S. D. = ± 3.53. P. E. Diff. = ± 0.645) for the controls (fig. 4 B). The possible harm from large amounts of water orally in shock following burns has been suggested (*9*) but not hitherto demonstrated.

Glucose.—Isotonic solutions of glucose (5.5 percent) had only slightly favorable effects on the acute mortality (figs. 3 A and 4 C), while five times this strength (27.5 percent) caused the animals to die faster than the controls. This is in contrast to the results produced by comparable solutions of NaCl (fig. 4 C).

KCl.—The behavior of glucose suggested that other factors besides restoration of fluid balance are important in the prevention of early

death following burns. This was further borne out by the behavior of KCl, which could, to a certain extent, replace NaCl as an electrolyte.

It was necessary to take into account the toxicity of KCl and allow a sufficient margin between the doses employed in burned animals and the maximum dose tolerated by normal mice. The $L.D._{50}$ by mouth for normal mice was approximately 1.5 gm. per kg. The addition of sodium is known to decrease the intravenous toxicity of KCl (*10*), and by mouth the following results have been obtained:

	Number of mice treated	*Number died*
5 percent KCl:		
KCl 0.5 gm. per kg	5	0
KCl 1.0 gm. per kg	10	0
KCl 1.5 gm. per kg	10	6
KCl 2.0 gm. per kg	10	10
5 percent KCl + 4.5 percent NaCl:		
KCl 1.0 gm. per kg	5	0
KCl 1.25 gm. per kg	5	0
KCl 1.5 gm. per kg	5	0
KCl 2.0 gm. per kg	10	1
KCl 2.5 gm. per kg	10	4
KCl 3.0 gm. per kg	5	5

Administered orally to burned mice 1 percent KCl alone or equal parts of 1 percent KCl + 0.9 percent NaCl resulted in mortality curves higher than the controls. In the latter experiments the dose of KCl employed was one-ninth to one-eighteenth of the maximum dose tolerated by normal mice. The administration of one part of KCl to three parts of NaCl brought about a partial antagonism of the effects of NaCl (fig. 5 A, B, and C).

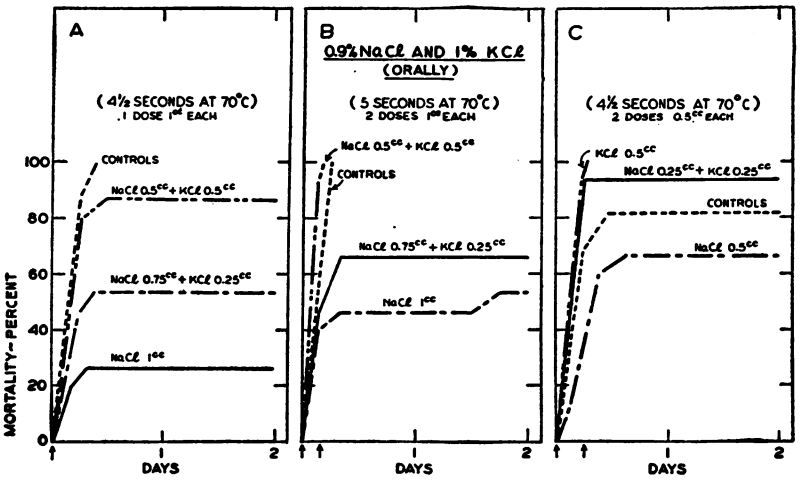

FIGURE 5.—KCl hastens death of burned mice, and antagonizes the action of NaCl. One percent KCl and 0.9 percent NaCl orally. 0.5 cc. doses in C.

Whether the degree of antagonism of Na:K as shown in normal mice is of sufficient magnitude to account for the effects in burned animals

cannot be decided without studies of the concentrations of these elements in the blood and tissues of burned animals.

Calcium.—Only tentative conclusions can be drawn concerning calcium since only two experiments were performed, and since the rate of absorption of calcium gluconate from the alimentary tract of the mouse is not known. A 7 percent solution of the gluconate was used, as this is equimolar to 0.9 percent NaCl. One cc. of this solution orally to normal mice caused no symptoms other than slight dyspnea.

Administered to burned mice 0.5 cc. orally did not affect the mortality rate, while 0.25 cc. did not antagonize the action of 1 cc. of saline (fig. 6 B). These results indicate that calcium is without effect.

COMPARISON OF SODIUM SALTS

The effectiveness of sodium acetate, succinate, bicarbonate, and lactate was compared with the effectiveness of NaCl. The strengths of the solutions were such that each contained the same amount of sodium as 0.9 percent NaCl. Two experiments of 15 mice each were

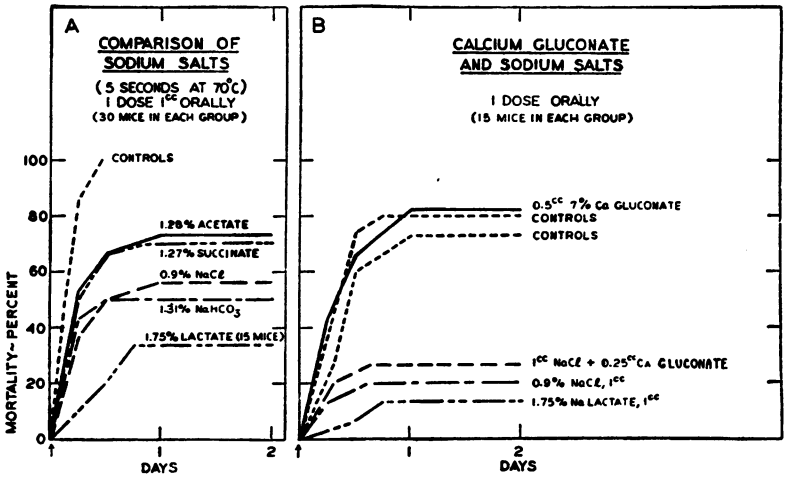

FIGURE 6.—Comparison of oral administration of sodium chloride, acetate, succinate, bicarbonate, lactate; 1 cc. of each solution contains 3.6 mg. of sodium. Calcium gluconate is without effect. Two experiments combined in A (30 mice in each group).

used for each salt, employing 1 cc. orally within an hour after the burn. Slight differences upon the mortality rate were noted. The lactate gave the lowest mortality curves, but the difference (15.3 percent. P. E. Diff. $= \pm 7.9$) is not significant statistically and would require a larger series of animals to establish its validity (fig. 6 A and B).[5]

Apart from the fact that these other salts of sodium serve as a source of alkali in the body, a possible advantage because of the acidosis in shock, it was considered desirable to evaluate the activity of salts that

[5] Further studies revealed that the difference was not significant.

are less disagreeable to taste and less likely to cause vomiting than NaCl.

COMPARISON OF SERUM INTRAVENOUSLY WITH NaCl ORALLY

Two experiments were carried out upon mouse serum. The blood for each test was obtained by decapitation of 100 large mice. After standing overnight at 6° C., the serum was collected by centrifugation, and sterilized by passage through a Seitz filter. The first batch (fig. 7 A) caused marked transitory dyspnea in normal mice, but the second batch (fig. 7 B) was processed after the method of Goodner (*11*), and 1 cc. was tolerated in normal mice without symptoms.

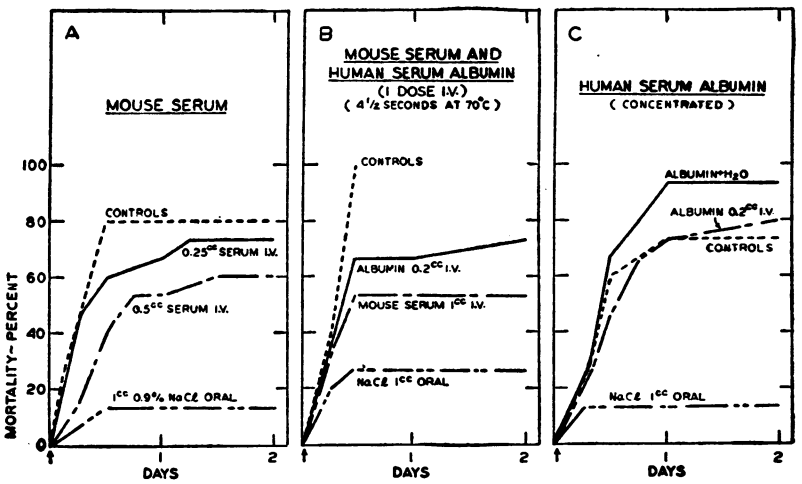

FIGURE 7.—Comparison of mouse serum and of 25 percent human serum albumin intravenously with 0.9 percent NaCl orally. The albumin solution was five times isotonic, and in experiment C one group was given 0.8 cc. of water by mouth following 0.2 cc. of albumin I.V.

The serum was injected intravenously into the lateral tail veins within an hour following the burns. Amounts of 0.25 cc., 0.5 cc., or 1 cc. proved less effective than 1 cc. of saline orally. The validity of the differences between the 1 cc. doses must be established upon a larger series of mice.

A few experiments were made upon two samples of normal human serum albumin, obtained through the courtesy of Commander L. R. Newhouser, Medical Corps, United States Navy. These preparations contained 25 percent serum albumin in buffered solutions containing 0.9 percent NaCl, and were osmotically five times the isotonic strength of human blood plasma. They proved to be of low toxicity to the mouse, 0.5 cc. intravenously being tolerated by normal mice.

In burned mice 0.2 cc., representing 1 cc. of isotonic solution, was injected intravenously. Only slight reduction in mortality was obtained from this treatment. A comparison of two experiments with

a total of 30 mice in each group shows a mortality of 73 percent with serum albumin, 20 percent with saline orally, and 87 percent among the controls. An additional group of 15 mice was given 0.8 cc. of water orally along with the intravenous albumin, in order to compensate for the hypertonicity. No benefit resulted from this procedure (fig. 7 B and C).

The ineffectiveness of human serum albumin must be appraised with consideration of the fact that it represents a protein foreign to the mouse. On the other hand it is possible to correlate the degree of effect of this preparation and of mouse serum with the sodium contained in the doses administered.

DISCUSSION

It would appear from these experiments that the acute mortality following burns in mice is closely related to a disturbance of the sodium: potassium balance in the body as well as the escape of fluids from the circulation. The former factor seems the more important, and indeed may be causally connected with the hemoconcentration and other effects attributed to the loss of fluids in the burned area. This view has been maintained by Scudder (*12*), who has emphasized the role of potassium as a toxic factor in shock, although his conclusions have not been generally accepted (*2*, *13*, *14*). Further considerations of the specific roles of the sodium ion, potassium ion, and fluid loss, as well as the underlying mechanisms by which these changes are brought about, must be left for future study and discussion.

In future experiments dealing with the systemic therapy of shock in burns it is believed that NaCl orally should be used as a standard of comparison. A more extensive investigation of the effects of blood and blood substitutes is desirable. Since it is possible to bring about the survival of most of the animals through the stage of shock, and since the majority of these mice die during the subsequent two weeks, attention can be directed to the experimental chemotherapy of these later phases of burns.

SUMMARY

Employing a standardized procedure for the production of burns fatal to mice within 48 hours, the effects of systemic therapy have been studied.

No benefit was observed from epinephrine, posterior pituitary extract, adrenal cortical extract, or desoxycorticosterone acetate injected subcutaneously following the burns.

Sodium chloride by mouth or intraperitoneally caused a significant reduction in the mortality. Intravenous administration was less effective. Isotonic NaCl by mouth was superior to hypertonic solutions.

KCl caused an acceleration in the time of death, and when administered with NaCl it antagonized the effects of the latter. Calcium gluconate orally was without action.

Isotonic glucose solutions orally showed slight therapeutic action. The administration of hypertonic glucose or water by mouth caused the animals to die faster than the controls.

Sodium acetate, succinate, bicarbonate, and lactate were as effective as NaCl.

Mouse serum intravenously was slightly less active than equivalent volumes of 0.9 percent NaCl orally. Little effect was observed from the intravenous administration of a hypertonic solution of human serum albumin.

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AMERICAN AND AUSTRALIAN Q FEVERS: PERSISTENCE OF THE INFECTIOUS AGENTS IN GUINEA PIG TISSUES AFTER DEFERVESCENCE [1]

By R. R. PARKER, *Director, Rocky Mountain Laboratory,* and EDWARD A. STEINHAUS, *Associate Bacteriologist, United States Public Health Service*

Davis and Cox (*1*) have reported that in isolated tests testicular washings from guinea pigs inoculated with *Rickettsia diaporica,* the causative agent of American Q fever, were found infectious 6 days after defervescence, the spleen 6, 22, and 23 days, and lymph nodes, brain, and liver 23 days; also a urine sample taken from the bladder at time of death was infectious (time not given).

Additional experiments relating to the persistence of the infectious agent of American Q fever in guinea pig tissues and similar but somewhat more comprehensive ones concerning the same phenomenon in the possibly identical Australian Q fever (*R. burneti*) are reported in this paper. Only male animals were used. In these experiments successive pairs of guinea pigs were sacrificed at various intervals after inoculation and the tissues selected for test were transferred to two fresh ones, each of which received 1 cc. of a saline suspension intraperitoneally. Urine, which was drawn from the bladder at autopsy, was used in 1 cc. amounts or less, depending on the quantity available. The immunity of each of the four recipients was challenged with the homologous rickettsia on or shortly after the twentieth day after inoculation. A febrile period following the tissue or urine inoculation and complete absence of fever after the immunity test was considered as evidence that infection had occurred.

EXPERIMENT 1.—AMERICAN Q FEVER

The donor guinea pigs were inoculated subcutaneously. The following tissues were transferred over a period of 54 days after inoculation: spleen, liver, kidney, lung, and brain. The infectious agent was recovered (+) or not recovered (−) as follows:

Tissue	Days after inoculation										
	12	13	14	16	17	18	20	23	26	32	54
Spleen	+	+	+	+	+	+	+	+	+	+	−
Liver	+	+	+	+	+	+	+	+	+	−	−
Kidneys	+	+	+	+	+	+	+	+	+	+	+
Lungs	+	+	+	+	+	+	+	−	+	−	−
Brain	+	+	+	+	+	+	+	−	+	−	−

[1] From the Rocky Mountain Laboratory (Hamilton, Mont.), Division of Infectious Diseases, National Institute of Health.

In this one experiment the two donor guinea pigs for any one date were so selected that both had been afebrile the same number of days. Therefore, the number of days after defervescence corresponds to "days after inoculation," respectively, as follows: 1, 2, 3, 4, 5, 7, 9, 11, 15, 20, and 40.

Another test was made of urine samples taken from guinea pigs sacrificed at intervals up to 45 days. The 5-, 12-, 16-, 20-, 25-, and 36-day samples were positive, an 8-day one uncertain, and the 40- and 45-day tests negative.

In other experiments the rickettsia was recovered from the clots and serums of blood specimens taken at various intervals up to and including the fourth and ninth days after defervescence, respectively, but not through 36 days thereafter.[2]

In a test with field mice (*Microtus* sp.) the spleens of animals sacrificed 4, 6, 8, 10, 14, 18, 24, and 30 days after inoculation were infectious, but not that from a mouse sacrificed on the fortieth day. Later tests were not made.

EXPERIMENT 2.—AUSTRALIAN Q FEVER

The donor guinea pigs were injected intraperitoneally. The following materials were used for transfer: spleen, liver, kidney, testicle, seminal vesicle, and urine. The infectious agent was recovered (+), not recovered (−), or its occurrence questionable (?) as follows:

Test material	Days after inoculation																	
	5	8	11	13	15	20	25	30	35	40	50	60	70	80	90	100	110	120
Spleen	+	+	+	+	+	+	+	+	+	+	?	−	−	−	+	−	+	+
Liver	+	+	+	+	+	+	+	+	+	+	−	−	−	−	−	−	−	−
Kidneys	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Testes [1]			+			+		+		+	+	?		+		+		
Seminal vesicles	+	+	+	+	+	+	−	+	+	+	−	+	+	−	+	+	−	−
Urine	+	+	+	+	+	−	+	+	−	+	−	−	−	−	−	−	+	−

[1] Absence of symbol indicates that no test was made on this day.

The shortest period from inoculation to defervescence was 7 days, the longest 16, and the average 10.33 days.

EXPERIMENT 3.—AUSTRALIAN Q FEVER

This experiment was similar to the second except that the guinea pigs used as donors were inoculated subcutaneously instead of intraperitoneally and lung and brain tissue were also used as test materials.

[2] It was found that the rickettsia persisted for at least 40 days in pooled serums and clotted blood, drawn on the third day of fever, when held at room temperature (23° C.) or in the cold room (7° C.). There was not sufficient material for further tests.

The infectious agent was recovered (+), not recovered (−), or its occurrence questionable (?) as follows:

Test material	Days after inoculation																	
	5	8	11	13	15	20	25	30	35	40	50	60	70	80	90	100	110	120
Spleen	+	+	+	+	+	+	+	+	+	+	+	−	+	−	−	−	−	−
Liver	+	+	+	+	+	+	−	+	+	−	−	+	−	−	−	−	−	−
Kidneys	+	+	+	+	+	+	+	+	+	+	+	+	?	+	+	?	?	?
Testes	+	+	+	+	+	+	+	+	+	+	?	−	−	−	−	−	−	−
Seminal vesicles	+	+	+	+	+	+	+	+	+	+	+	−	+	−	−	−	−	−
Brain	+	+	+	+	+	?	−	−	−	−	−	?	−	−	−	−	−	−
Lungs	+	+	+	+	+	+	+	+	−	−	−	−	−	−	−	−	−	−
Urine	+	+	+	+	+	+	+	+	+	?	+	+	+	−	+	−	?	−

The shortest period from inoculation to defervescence was 7 days, the longest 12, and the average 8.8 days.

TESTS RELATING TO THE POSSIBILITY OF THE TRANSMISSION OF AMERICAN AND AUSTRALIAN Q FEVERS DURING COPULATION

It was determined that guinea pigs injected with the Australian Q fever rickettsia via the urethra and via the vagina were uniformly infected. The inoculum used was a saline suspension of infected guinea pig spleen tissue. Of females similarly injected with seminal vesicle tissue taken from an animal sacrificed 6 days after inoculation with the Australian Q fever rickettsia, 50 percent became infected.

Two other experiments, one with American and the other with Australian Q fever, were made to obtain information relative to the possibility that these diseases may be transmitted from infected male guinea pigs to normal females during mating. In the American Q fever test, nine infected males, febrile 3 to 6 days, were each placed with a virgin female. One female remained afebrile; the others had 1 to several days of fever, apparently due to intercurrent conditions. Six became pregnant. All were susceptible to American Q fever rickettsiae injected 61 days after the sexes were placed together. All six pregnant animals died and four of them aborted 3, 4, 4, and 6 days, respectively (on second, second, and first day of fever, and the day before onset of fever), after receiving the immunity test. Only one of the three nonpregnant animals died.

In the corresponding test with the Australian disease 10 virgin females were paired with infected males when the latter had been febrile from 1 to 3 days. As in the preceding experiment most of the females exhibited apparently nonspecific fevers for 1 or more days. Four females became pregnant. Nine females were susceptible when the immunity test was given 55 days after the sexes were paired. The four pregnant animals aborted their young and three died. The young were aborted 4, 8, 10, and 10 days, respectively, after the challenge dose (three on second day of fever, the last on the day before

the onset of fever). Of the five susceptible nonpregnant females none died. One nonpregnant animal remained afebrile following the immunity test. It had been irregularly febrile for a 10-day period beginning 4 days after it had been placed with a male. Evidently this animal became infected while with the male. However, it is not known that mating took place and there is no certainty that infection occurred as a result of copulation.

It is of interest that the aborted fetuses of two of the guinea pigs used in the last experiment were found to be infected. The pooled spleens and livers of the fetuses of each parent were tested in two fresh guinea pigs. All four test animals had typical febrile periods. Three died.

TESTS OF URINE OF RECOVERED AMERICAN Q FEVER PATIENTS

Urine from two patients has been tested. From one there was a single sample taken 72 days after he became afebrile. From the other there were five samples taken 3 days after onset and 1, 9, 15, and 22 days after defervescence, respectively. All six were negative.

DISCUSSION

The data under experiments 1, 2, and 3 show definitely that the rickettsial agents of American and Australian Q fevers may be present in various tissues of guinea pigs for considerable periods after defervescence. In the American Q fever test, which covered a period of only 54 days after inoculation, the rickettsia was recovered from the kidneys for 40 days (the duration of the experiment), from the spleen for 20 days, from the liver, lungs, and brain for 15 days, and from the urine for 18 days after the last day of fever.

The number of each group of four recipient guinea pigs that received suspensions of tissue and urine from the donors is not shown in the tables. However, in general, all four recipients were infected by the materials from donors sacrificed before the twenty-fifth day after inoculation. Thereafter, three, two, or occasionally only one animal became infected except that in the case of kidney tissue, infection usually resulted in all four recipients through the full course of experiments 1 and 3.

In some of the tissue and urine tests, mostly the later ones, two or three of the recipient guinea pigs definitely did not become infected, while the others exhibited reactions which could not be interpreted with certainty. Some of these questionable results were due to animals which had intercurrent infections following the immunity test; other animals concerned had brief periods (1 or 2 days) of low temperature both before and after immunity test, either or neither of which might have been specific. These doubtful results are represented in the tables by question marks.

In the Australian Q fever tests which continued for 120 days after inoculation the rickettsia was found present in the materials tested (using the average days from inoculation to the end of fever) for at least the following periods after defervescence, using the longest period of the two experiments: kidney and spleen, 110 days (the duration of the experiment); liver, 50 days; seminal vesicles and testes, 90 days; brain, 5 days; lungs, 20 days; and in the urine for 100 days.

The data suggest that the rickettsia of the Australian disease is likely to persist longest in the organs of the abdominal cavity and of the urogenital system and to be most consistently present in those of the latter. The end point of persistence was not determined. Presence in the urine was not as consistent as in the kidneys.

The data for the two Australian Q fever tests suggest that, in tissues other than the kidneys, the rickettsia may persist longest when the guinea pigs are inoculated intraperitoneally. However, there is no apparent reason why this should necessarily be true; also, the results are not sufficiently clear-cut to justify a conclusion. The rickettsia was more consistently present in the urine of the animals injected subcutaneously than in those injected intraperitoneally. This suggests that the obtaining of a positive urine sample involves an element of chance.

The persistence of the rickettsia of Australian Q fever in the seminal vesicles suggested the possibility that infected males might transmit the disease to normal females during copulation. Of the nine tests made with American Q fever and 10 with Australian Q fever to obtain information on this point, only one female became infected while with a male, but there is no evidence that this infection resulted from copulation. Data from these tests suggest the possibility that both diseases affect pregnant animals more severely.

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INCIDENCE OF HOSPITALIZATION, FEBRUARY 1943

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among about 8,000,000 members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover about 60 hospital service plans scattered throughout the country, mostly in large cities.

Item	February—	
	1943	1942
1. Number of plans supplying data	65	60
2. Number of persons eligible for hospital care	9,739,448	8,082,576
3. Number of persons admitted for hospital care	76,661	65,966
4. Incidence per 1,000 persons, annual rate, during current month (daily rate × 365)	102.6	106.3
5. Incidence per 1,000 persons, annual rate for the 12 months ended Feb. 28	108.3	106.7

DEATHS DURING WEEK ENDED MARCH 13, 1943

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

	Week ended Mar. 13, 1943	Corresponding week, 1942
Data for 90 large cities of the United States:		
Total deaths	10,105	9,550
Average for 3 prior years	9,251	
Total deaths, first 10 weeks of year	101,721	93,632
Deaths under 1 year of age	722	553
Average for 3 prior years	504	
Deaths under 1 year of age, first 10 weeks of year	7,226	5,713
Data from industrial insurance companies:		
Policies in force	65,392,965	64,963,934
Number of death claims	14,067	13,506
Death claims per 1,000 policies in force, annual rate	11.2	10.8
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10.8	10.2

PREVALENCE OF DISEASE

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

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 20, 1943

Summary

Of the nine common communicable diseases included in the following tables, the current incidence of only measles, meningococcus meningitis, poliomyelitis, and whooping cough is above the corresponding 5-year (1938–42) medians.

A total of 614 cases of meningococcus meningitis (exclusive of delayed reports of 5 cases in Virginia) was reported for the week. The largest weekly total recorded in any previous year (weekly records are available since 1927) was 367 for the week ended March 1, 1930. Increases were shown during the current week in all of the nine geographic divisions except the East North Central, Mountain, and Pacific. States reporting the largest numbers for the current week are as follows (figures for the preceding week in parentheses): New York, 64 (57); Virginia, 53 (29); Mississippi, 44 (12); Massachusetts, 34 (29); Pennsylvania, 32 (26); New Jersey, 29 (21); California, 29 (36); Texas, 28 (18); Rhode Island, 24 (11); North Carolina, 23 (16).

The incidence rates (annual basis) for the first 11 weeks of the year are higher in each of the nine geographic divisions than the corresponding average rates for the 6-year period 1937–1942, ranging from 2.6 times as high in the East South Central to 13.3 times as high in the New England States. The rate for the total (4,659 cases) for the first 11 weeks of 1943 is 16.8 per 100,000 population, which is 5.4 times the average rate for the 6-year period. The highest average rate for the first 11 weeks during the 6-year period was recorded for the East South Central area.

There were 26 cases of poliomyelitis reported (no more than 3 cases in any one State), as compared with a median of 16. The total number of smallpox cases reported was 36, 10 of which were in North Carolina and 8 in Illinois. The corresponding 5-year median is 76.

A total of 9,838 deaths was recorded for the week in 88 large cities of the United States, as compared with 10,054 in the same cities for the preceding week and a 3-year average of 8,964. The cumulative total during the first 11 weeks of the year is 110,978, as compared with 101,960 in the corresponding period of 1942.

Telegraphic morbidity reports from State health officers for the week ended March 20, 1943, and comparison with corresponding week of 1942, and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942	
NEW ENG.												
Maine	0	1	1	------	3	4	9	173	173	12	4	0
New Hampshire	0	0	0	------	------	------	13	10	18	0	0	0
Vermont	0	0	0	------	------	------	310	15	18	3	0	0
Massachusetts	5	1	2	------	------	------	1,394	830	811	34	3	2
Rhode Island	1	1	0	------	1	------	14	171	9	24	0	0
Connecticut	0	0	1	3	2	4	418	413	156	3	5	1
MID. ATL.												
New York	21	26	26	[1] 8	[1] 11	[1] 33	2,321	683	1,408	64	22	3
New Jersey	3	4	5	15	16	23	1,467	443	443	29	5	1
Pennyslvania	10	18	18	3	------	------	2,851	1,087	1,087	32	2	6
E. NO. CEN.												
Ohio	5	7	12	20	22	22	732	196	196	6	1	2
Indiana	2	7	11	3	57	57	403	125	125	5	0	1
Illinois	6	20	21	13	41	41	963	645	645	18	5	3
Michigan [3]	8	7	8	27	4	23	555	246	248	7	1	1
Wisconsin	1	2	2	40	38	200	1,131	871	871	4	0	1
W. NO. CEN.												
Minnesota	3	3	3	------	5	5	94	947	179	3	1	0
Iowa	0	1	3	------	4	28	332	402	175	0	0	0
Missouri	6	2	9	8	1	16	375	325	151	27	0	0
North Dakota	0	1	2	1	------	44	131	64	28	1	0	0
South Dakota	0	3	0	2	------	2	52	4	4	0	0	0
Nebraska	0	4	2	24	11	11	249	304	53	2	0	1
Kansas	5	3	3	6	9	22	513	415	533	5	1	0
SO. ATL.												
Delaware	2	1	1	------	------	------	36	8	8	3	0	0
Maryland [3]	11	10	5	4	5	41	73	890	170	25	9	1
Dist. of Col	0	0	6	5	5	4	100	83	39	3	1	0
Virginia	7	10	14	792	382	552	779	290	376	[3] 58	5	3
West Virginia	3	2	6	68	257	218	36	148	148	3	0	1
North Carolina	8	10	13	77	28	28	77	1,362	1,286	23	2	1
South Carolina	3	1	5	840	505	754	199	257	257	18	0	0
Georgia	4	4	9	152	119	144	187	450	421	9	0	1
Florida	4	3	6	10	20	9	62	185	185	17	2	0
E. SO. CEN.												
Kentucky	6	5	5	5	6	69	1,054	91	91	12	2	2
Tennessee	7	6	6	93	71	161	341	140	165	8	2	2
Alabama	5	7	7	158	440	335	226	349	349	10	0	3
Mississippi [3]	5	12	8	------	------	------	------	------	------	44	1	1
W. SO. CEN.												
Arkansas	12	5	7	99	226	291	102	235	235	5	0	0
Louisiana	6	7	7	13	3	27	232	188	61	13	1	1
Oklahoma	7	11	6	190	213	213	65	376	126	2	0	1
Texas	34	50	36	1,543	1,228	1,361	1,160	2,363	811	28	10	1
MOUNTAIN												
Montana	2	3	3	24	33	11	343	87	31	0	0	0
Idaho	0	2	0	------	------	2	126	81	44	2	0	0
Wyoming	0	0	0	46	192	------	177	95	29	0	0	0
Colorado	7	8	10	46	74	44	717	247	247	0	0	0
New Mexico	0	2	4	1	5	7	20	66	66	1	0	0
Arizona	4	0	1	68	209	209	47	365	95	1	1	0
Utah [3]	1	0	0	8	5	8	466	155	155	7	0	0
Nevada	0	0	------	21	3	------	27	4	------	1	0	------
PACIFIC												
Washington	3	2	2	1	9	9	947	322	322	9	1	1
Oregon	0	4	4	25	28	31	491	167	167	9	2	0
California	23	17	26	74	217	211	742	5,148	609	29	2	2
Total	240	293	315	4,536	4,508	6,366	23,150	22,521	22,521	[3] 619	91	54
11 weeks	3,191	3,542	4,379	49,953	54,130	85,103	159,593	158,613	158,613	4,659	752	587

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 20, 1943, and comparison with corresponding week of 1942, and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942		Mar. 20, 1943	Mar. 21, 1942	
NEW ENG.												
Maine	0	0	0	20	11	11	0	0	0	0	0	0
New Hampshire	0	0	0	6	12	3	0	0	0	0	0	0
Vermont	0	0	0	8	11	8	0	0	0	0	0	0
Massachusetts	0	1	0	592	330	169	0	0	0	1	1	1
Rhode Island	1	0	0	20	8	10	0	0	0	0	0	0
Connecticut	0	1	0	69	44	89	0	0	0	1	0	0
MID. ATL.												
New York	1	0	0	655	548	673	0	0	0	8	3	3
New Jersey	2	0	0	183	197	197	0	0	0	0	0	1
Pennsylvania	2	0	0	342	572	436	0	0	0	9	8	6
E. NO. CEN.												
Ohio	0	0	1	327	374	343	5	0	0	3	2	2
Indiana	0	2	0	117	153	191	1	0	5	1	0	1
Illinois	2	1	0	224	269	516	8	2	10	2	1	2
Michigan [3]	0	0	0	96	259	383	0	2	3	1	1	1
Wisconsin	3	1	1	335	191	172	1	0	4	0	0	1
W. NO. CEN.												
Minnesota	0	0	0	62	113	105	0	2	5	0	0	1
Iowa	0	0	0	94	47	65	1	0	4	1	1	1
Missouri	2	1	0	138	76	86	0	10	10	0	1	2
North Dakota	0	1	0	7	32	28	0	0	3	0	0	0
South Dakota	0	0	0	15	39	12	1	0	1	0	0	0
Nebraska	0	1	0	36	50	25	0	1	1	0	0	0
Kansas	0	0	0	64	125	125	2	1	1	1	0	0
SO. ATL.												
Delaware	0	0	0	6	51	17	0	0	0	0	0	0
Maryland [3]	0	0	0	112	85	47	0	0	0	7	1	1
Dist. of Col	0	0	0	16	16	18	0	0	0	0	0	0
Virginia	1	0	0	53	28	36	0	0	0	2	2	2
West Virginia	0	1	0	24	41	50	0	0	0	2	2	2
North Carolina	0	0	0	28	45	41	10	0	0	5	1	0
South Carolina	0	0	0	8	5	4	0	0	0	0	0	1
Georgia	0	0	0	6	20	14	0	0	0	2	4	3
Florida	1	0	0	11	4	6	0	0	0	5	3	3
E. SO. CEN.												
Kentucky	1	0	0	49	135	100	0	0	0	0	5	2
Tennessee	0	0	0	51	75	75	0	2	1	0	2	2
Alabama	0	1	1	18	29	23	1	2	0	1	1	2
Mississippi [3]	2	0	0	7	29	5	0	0	1	0	1	1
W. SO. CEN.												
Arkansas	0	0	1	7	6	7	3	4	3	3	2	3
Louisiana	0	2	1	11	4	11	1	0	1	1	3	9
Oklahoma	0	0	0	27	21	21	0	0	14	1	1	1
Texas	3	0	1	65	50	71	0	14	14	6	4	7
MOUNTAIN												
Montana	0	0	0	6	23	26	0	0	0	0	0	0
Idaho	0	1	0	12	6	11	0	0	0	0	0	1
Wyoming	0	0	0	40	27	10	0	0	0	0	0	0
Colorado	0	0	0	103	42	51	1	0	1	0	0	0
New Mexico	0	0	0	1	2	13	0	0	0	0	0	0
Arizona	1	0	0	16	6	6	0	0	0	0	1	1
Utah [3]	0	0	0	57	32	29	0	0	0	0	0	0
Nevada	0	0	------	6	0	------	0	0	------	0	0	------
PACIFIC												
Washington	1	0	0	46	37	46	0	0	0	1	2	2
Oregon	1	0	0	6	10	24	0	0	2	0	3	2
California	2	2	2	158	136	193	1	0	2	3	7	5
Total	26	16	16	4,360	4,426	5,029	36	40	76	67	63	88
11 weeks	304	266	266	42,593	44,084	51,089	302	246	810	585	842	842

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 20, 1943, and comparison with corresponding week of 1942, and 5-year median—Con.

Division and State	Whooping cough			Week ended March 20, 1943								
	Week ended		Median 1938–42	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Mar. 20, 1943	Mar. 21, 1942			Amebic	Bacillary	Unspecified					
NEW ENG.												
Maine	67	16	32	0	0	0	0	0	0	0	0	0
New Hampshire	1	6	5	0	0	0	0	0	0	0	0	0
Vermont	23	43	42	0	0	0	0	0	0	0	0	0
Massachusetts	166	269	171	0	0	2	0	1	0	0	0	0
Rhode Island	34	38	22	0	0	0	0	1	0	0	0	0
Connecticut	65	86	66	0	1	0	0	1	0	0	0	0
MID. ATL.												
New York	423	527	404	3	14	2	0	2	0	0	0	0
New Jersey	206	268	163	1	1	0	0	0	0	0	0	0
Pennsylvania	369	220	225	0	0	8	0	0	0	0	0	0
E. NO. CEN.												
Ohio	233	116	199	0	0	0	0	1	0	0	0	0
Indiana	72	45	39	0	0	0	0	0	0	0	0	0
Illinois	153	124	94	0	0	0	0	0	0	0	0	0
Michigan [2]	253	147	188	0	0	1	0	0	0	0	0	0
Wisconsin	209	182	140	0	0	0	0	0	0	0	0	0
W. NO. CEN.												
Minnesota	54	25	27	0	2	0	0	0	0	0	0	0
Iowa	18	15	15	0	0	0	0	0	0	0	0	0
Missouri	22	9	40	0	0	0	0	0	0	0	3	0
North Dakota	12	1	4	0	0	0	0	0	0	0	0	0
South Dakota	1	2	2	0	0	0	0	0	0	0	1	0
Nebraska	11	7	6	0	0	0	0	0	0	0	0	0
Kansas	61	42	57	0	0	1	0	0	0	0	0	0
SO. ATL.												
Delaware	1	0	5	0	0	0	0	0	0	0	0	0
Maryland [2]	120	35	70	0	0	0	3	0	0	0	0	0
Dist. of Col.	26	15	15	0	0	0	0	0	0	0	0	0
Virginia	55	38	80	0	0	0	75	0	0	0	0	0
West Virginia	55	25	46	0	0	0	0	0	0	0	0	0
North Carolina	163	127	340	0	0	0	0	0	0	0	0	0
South Carolina	43	57	57	0	0	0	0	0	0	0	0	0
Georgia	36	32	51	0	0	0	1	0	0	0	4	15
Florida	32	37	18	0	0	1	0	0	0	0	0	8
E. SO. CEN.												
Kentucky	35	82	51	0	0	0	0	0	0	0	0	0
Tennessee	122	33	40	0	0	0	0	0	0	0	5	0
Alabama	49	23	31	0	0	0	0	0	0	0	0	1
Mississippi [2]	------	------	------	0	0	0	0	0	0	0	0	0
W. SO. CEN.												
Arkansas	42	10	11	0	1	6	0	0	0	0	0	0
Louisiana	8	19	19	0	4	0	0	0	0	0	1	3
Oklahoma	23	15	15	0	0	0	0	0	0	0	0	0
Texas	420	117	208	0	7	124	0	4	0	0	2	10
MOUNTAIN												
Montana	12	10	10	0	0	0	0	0	0	1	0	0
Idaho	0	2	19	0	0	0	0	0	0	0	0	0
Wyoming	1	10	3	0	0	0	0	0	0	0	0	0
Colorado	29	36	36	0	0	0	0	0	0	0	0	0
New Mexico	41	9	16	0	0	0	0	0	0	0	0	0
Arizona	23	81	20	0	0	0	11	2	0	0	0	0
Utah [2]	40	87	87	0	0	0	0	0	0	0	0	0
Nevada	0	3	------	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	25	115	84	0	0	0	0	0	0	0	0	0
Oregon	10	39	28	0	0	0	0	0	0	0	0	0
California	318	286	286	0	1	5	0	1	0	0	0	0
Total	4,183	3,531	4,024	4	31	150	90	13	0	1	16	37
11 weeks	42,972	43,609	44,995	------	------	------	------	------	------	------	------	------

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed report of 5 cases in Virginia included.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 6, 1943

This table lists the reports from 90 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, 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								
Atlanta, Ga	0	0	48	1	12	0	7	0	0	0	0	1
Baltimore, Md	2	0	3	1	24	15	21	0	41	0	1	83
Barre, Vt	0	0	------	0	0	0	0	0	0	0	0	0
Billings, Mont	0	0	------	0	0	0	0	0	1	0	0	0
Birmingham, Ala	0	0	1	2	0	1	12	0	2	0	0	0
Boise, Idaho	0	0	------	0	0	0	0	0	0	0	0	0
Boston, Mass	0	0	------	0	174	6	21	1	127	0	0	38
Bridgeport, Conn	0	0	------	0	1	1	2	0	8	0	0	0
Brunswick, Ga	0	0	------	0	1	0	0	0	0	0	0	0
Buffalo, N. Y	1	0	------	0	73	2	9	0	8	0	0	7
Camden, N. J	0	0	1	0	37	1	3	0	1	0	0	8
Charleston, S. C	0	0	32	1	0	1	5	0	0	0	0	0
Charleston, W. Va	0	0	3	0	0	0	0	0	3	0	0	0
Chicago, Ill	9	0	4	2	401	7	29	0	67	0	0	59
Cincinnati, Ohio	0	0	------	0	74	2	4	0	20	0	0	10
Cleveland, Ohio	0	0	2	0	17	0	14	0	28	0	0	35
Columbus, Ohio	0	0	------	0	10	1	6	0	12	0	0	2
Concord, N. H	0	0	------	0	0	0	0	0	1	0	0	0
Cumberland, Md	0	0	------	0	0	0	1	0	0	0	0	1
Dallas, Tex	0	0	------	0	0	0	0	0	8	0	0	24
Denver, Colo	3	0	11	1	459	0	5	0	11	0	0	8
Detroit, Mich	3	0	1	2	189	3	18	0	42	0	0	98
Duluth, Minn	0	0	------	0	1	0	3	0	9	0	0	2
Fall River, Mass	0	0	------	0	7	0	2	0	7	0	0	16
Fargo, N. Dak	0	0	------	0	1	0	0	0	0	0	0	0
Flint, Mich	0	0	------	0	5	0	0	0	4	0	0	5
Fort Wayne, Ind	0	0	------	0	0	0	4	0	0	0	0	0
Frederick, Md	0	0	------	0	2	0	0	0	0	0	0	0
Galveston, Tex	0	0	------	0	1	0	2	0	3	0	0	0
Grand Rapids, Mich	0	0	------	0	5	0	0	0	3	0	0	15
Great Falls, Mont	1	0	------	0	26	1	2	0	0	0	0	7
Hartford, Conn	0	0	------	0	13	1	7	0	2	0	0	5
Helena, Mont	0	0	------	0	21	0	0	0	0	0	0	0
Houston, Tex	0	0	1	1	7	1	11	0	3	0	0	3
Indianapolis, Ind	0	0	------	1	132	0	9	0	15	0	0	11
Kansas City, Mo	1	0	------	0	85	4	8	0	57	0	0	1
Kenosha, Wis	0	0	------	0	2	0	0	0	2	0	0	0
Little Rock, Ark	0	0	------	0	3	1	5	0	0	0	0	1
Los Angeles, Calif	3	0	14	1	107	4	10	0	32	0	0	21
Lynchburg, Va	0	0	------	0	0	0	2	0	0	0	0	6
Memphis, Tenn	0	0	2	1	52	4	3	0	4	0	0	7
Milwaukee, Wis	0	0	1	1	373	0	1	0	108	0	0	86
Minneapolis, Minn	2	0	------	1	12	3	6	0	17	0	0	9
Missoula, Mont	0	0	------	0	0	0	0	0	0	0	0	0
Mobile, Ala	0	0	1	0	0	1	4	0	0	0	0	0
Nashville, Tenn	0	0	------	0	77	0	2	0	3	0	0	4
Newark, N. J	0	0	3	0	87	4	4	0	13	0	0	10
New Haven, Conn	0	0	------	0	1	2	0	0	2	0	0	3
New Orleans, La	0	0	5	1	37	0	13	0	5	0	1	0
New York, N. Y	23	0	12	4	333	36	80	2	383	0	3	85
Omaha, Nebr	0	0	------	0	4	1	6	0	2	0	0	0
Philadelphia, Pa	0	1	4	1	797	13	45	0	75	0	1	78
Pittsburgh, Pa	0	0	6	6	0	4	18	0	10	0	0	34
Portland, Maine	0	0	------	0	0	3	3	0	1	0	0	13
Providence, R. I	0	0	1	0	3	7	4	0	8	0	0	33

City reports for week ended March 6, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Pueblo, Colo	0	0	------	0	1	1	1	0	1	0	0	11
Racine, Wis	0	0	------	0	23	0	1	0	36	0	0	1
Raleigh, N. C	0	0	------	0	0	0	1	0	0	0	0	0
Reading, Pa	0	0	------	0	153	1	2	0	1	0	1	16
Richmond, Va	0	0	4	2	12	2	1	0	6	0	0	2
Roanoke, Va	0	0	------	0	0	0	3	0	0	0	0	0
Rochester, N. Y	0	0	------	1	20	1	6	0	10	0	1	26
Sacramento, Calif	2	0	1	1	15	0	2	0	5	0	0	0
St. Joseph, Mo	0	0	------	0	1	0	1	0	0	0	0	0
St. Louis, Mo	1	0	2	0	35	11	23	0	18	0	0	3
St. Paul, Minn	0	0	------	0	2	1	5	0	5	0	0	56
Salt Lake City, Utah	0	0	------	2	79	2	2	0	20	0	0	18
San Antonio, Tex	1	0	2	2	3	0	13	0	1	0	0	3
San Francisco, Calif	2	0	1	1	91	5	10	1	11	0	0	23
Savannah, Ga	0	0	22	0	1	4	2	0	0	0	0	3
Seattle, Wash	1	0	------	0	100	0	6	0	6	0	0	7
Shreveport, La	1	0	------	0	0	0	5	0	0	0	0	0
South Bend, Ind	0	0	------	0	13	0	0	0	1	0	0	1
Spokane, Wash	0	0	------	0	146	0	3	0	3	0	0	1
Springfield, Ill	0	0	------	0	3	0	4	0	3	0	0	30
Springfield, Mass	0	0	------	0	8	0	1	0	73	0	0	0
Superior, Wis	0	0	------	0	4	0	0	0	2	0	0	1
Syracuse, N. Y	0	0	------	0	31	3	2	0	9	0	0	40
Tacoma, Wash	0	0	------	0	28	0	0	0	3	0	0	0
Tampa, Fla	0	0	------	0	0	0	1	0	0	0	0	0
Terre Haute, Ind	0	0	------	0	12	1	0	0	0	0	0	0
Topeka, Kans	0	1	------	0	77	0	2	0	0	0	0	9
Trenton, N. J	0	0	1	1	39	0	8	0	7	0	0	1
Washington, D. C	2	0	------	1	116	4	12	0	26	0	0	22
Wheeling, W. Va	0	0	------	0	2	0	0	0	0	0	0	1
Wichita, Kans	0	0	3	1	31	0	4	0	3	0	0	2
Wilmington, Del	0	0	------	0	13	1	4	0	2	0	0	12
Wilmington, N. C	0	0	------	0	5	0	5	0	4	0	0	5
Winston-Salem, N. C	0	0	1	0	0	0	2	0	0	0	0	35
Worcester, Mass	0	0	------	0	245	0	12	0	11	0	0	6
Total	58	2	193	40	4.975	167	555	4	1.415	0	8	1,164
Corresponding week 1942	73	7	294	52	3,903	29	540	3	1,492	1	15	1,112
Average, 1938–42	103	------	638	[1] 73	[2] 4,383	------	[1] 564	------	1,565	17	20	1,076

Anthrax.—Cases: Chicago, 1; Wilmington, Del., 1.
Dysentery, amebic.—Cases: Los Angeles, 2; New York, 14.
Dysentery, bacillary.—Cases: Buffalo, 2; Dallas, 1; Detroit, 1; Los Angeles, 4; New York, 3; St. Louis, 1.
Dysentery, unspecified.—Cases: San Antonio, 2; Worcester, 1.
Rocky Mountain spotted fever.—Cases: St. Louis, 1.
Tularemia.—Cases: New Orleans, 1.
Typhus fever.—Cases: Baltimore, 1; New York, 1.

[1] 3-year average, 1940–42.
[2] 5-year median.

PLAGUE INFECTION IN TACOMA, WASH.

Plague infection has been reported proved in tissue and fleas from rats, *R. norvegicus*, collected in Tacoma, Wash., as follows: In a pool of 65 fleas from 36 rats and another pool of 70 fleas from 42 rats taken from frame buildings in industrial sections on February 22 and

March 1, respectively; in tissue from 1 rat taken on February 27 from a frame building in a residential and commercial section.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (*human*).—1 death from plague (human) was reported on March 5, 1943, in Hamakua District, Island of Hawaii, T. H. All necessary precautions have been taken.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 20, 1943.—During the week ended February 20, 1943, 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	3	15	2	142	283	42	20	24	69	600
Diphtheria	1	13	8	33		10	2			67
Dysentery (bacillary)				3						3
German measles				10	29	2	18	2	3	64
Influenza		24	9		16	9			66	124
Measles		3	2	172	153	46	233	4	75	688
Meningitis, meningococcus				8	6		1	2	1	18
Mumps	1	177	4	190	1,017	112	102	119	199	1,921
Poliomyelitis			1			2				3
Scarlet fever		13	5	154	129	19	17	24	29	390
Tuberculosis (all forms)	1	7	2	122	50	7	1	17	28	235
Typhoid and paratyphoid fever				18	1		1			20
Whooping cough		6		147	99	20	6	38	15	331

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, 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]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-December 1942	January 1943	February 1943—week ended—			
				6	13	20	27
ASIA							
Ceylon	C	103	25	11			
China:							
Kunming (Yunnanfu)	C	[1]804					
Shanghai	C	869					
India	C	166,441	12,506				
Calcutta	C	2,331	188	22	28		
Chittagong	C	55					
Madras	C	84	772	83	43		
Rangoon	C	1					
Vizagapatam	C	13	4				
India (French)	C	14					
Pondichery	C	1					

[1] For the period May 12 to July 4, 1942.

PLAGUE

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

Place		January–December 1942	January 1943	February 1943—week ended—			
				6	13	20	27
AFRICA							
Basutoland	C	10					
Belgian Congo	C	4					
British East Africa:							
Kenya	C	731	8		1		
Nairobi	C	67					
Uganda	C	346					
Egypt: Port Said	C	3					
Madagascar	C	99	11				
Morocco	C	362	4				
Rhodesia (Northern)	C	15					
Senegal	C	[1] 6					
Union of South Africa	C	94	31				
ASIA							
China.[2]							
India	C	1,239	104	32			
Indochina (French)	C	81					
Palestine:							
Haifa	C	5					
Jaffa	C	[3] 7	[3] 6				
EUROPE							
Portugal: Azores Islands	C	1					
NORTH AMERICA							
Canada: Alberta Province—							
Plague-infected fleas		P					
SOUTH AMERICA							
Argentina: Cordoba Province	C	28					
Brazil:							
Alagoas State	C	3					
Pernambuco State	C	6					
Chile: Valparaiso	C	1					
Ecuador:							
Chimborazo Province	D	1					
Loja Province	C	4					
Peru:							
Ancash Department	C	8					
Lambayeque Department	C	3					
Liberatad Department	C	9					
Salaverry—Plague-infected rats		P					
Lima Department	C	57					
Lima	C	18					
Piura Department	C	21					
OCEANIA							
Hawaii Territory: [4] Plague-infected rats		122	11			15	
New Caledonia	C	[5] 2					

[1] Includes 4 suspected cases.

[2] Plague has been reported in China as follows: Chekiang Province, Apr. 1–10, 1942, 4 cases; Fukien Province, Jan. 1–Apr. 5, 1942, plague appeared in 11 localities; Hunan Province, week ended Apr. 18, 1942, 2 cases; Suiyuan Province, pneumonic plague appeared in epidemic form during the period Jan. 1–Apr. 4, 1942, in the northwestern area.

[3] At Jaffa and vicinity.

[4] During the week ended Mar. 6, 1943, 1 death from plague (human) was reported in Hamakua district, T. H., no other location being given.

[5] Pneumonic.

SMALLPOX

[C indicates cases]

Place		January–December 1942	January 1943	February 1943—week ended— 6	13	20	27
AFRICA							
Algeria	C	814	8				
Angola	C	49					
Basutoland	C	57					
Belgian Congo	C	1,132	61	21	59		
British East Africa: Tanganyika	C	84					
Dahomey	C	56	12				
Egypt	C		1				
French Equatorial Africa	C	2					
French Guinea	C	138	6				
Gold Coast	C	1,423	2				
Ivory Coast	C	71					
Morocco	C	1,558	13	3			
Nigeria	C	2,533	324				
Niger Territory	C	986	1				
Portuguese East Africa	C	51					
Rhodesia:							
Northern	C	9					
Southern	C	1					
Senegal	C	17					
Sierra Leone	C	1					
Sudan (French)	C	296	59				
Tunisia	C	1					
Union of South Africa	C	1,448					
Zanzibar	C	[1] 2					
ASIA							
Ceylon	C	7					
China	C	9					
India	C	30,219	1,219				
Indochina (French)	C	3,729					
Iran	C	194					
Iraq	C	307	14				
Palestine	C	10	11	4			
Syria and Lebanon	C	1,983	324				
Trans-Jordan	C	3					
EUROPE							
France:							
Seine Department	C	44					
Unoccupied zone	C	13					
Great Britain:							
England and Wales	C	5					
Scotland	C	89	1				
Ireland (Northern)	C	1					
Irish Free State	C	12					
Portugal	C	56	4	2			
Spain	C	211	56				
Turkey	C	1,841	1,176				
NORTH AMERICA							
Canada	C	5	1				
Guatemala	C	7					
Mexico	C	134	7				
Panama Canal Zone	C	[2] 1					
SOUTH AMERICA							
Argentina	C	169					
Brazil	C	3	12	1	1		
Colombia	C	615	14				
Ecuador	C	6	1				
Peru	C	1,152	[3] 3				
Venezuela (alastrim)	C	159	1				

[1] Imported. [2] In the Canal Zone. [3] Deaths.

TYPHUS FEVER

[C indicates cases]

Place		January–December 1942	January 1943	February 1943—week ended— 6	13	20	27
AFRICA							
Algeria	C	35,205	8		[1] 419		
Basutoland	C	34					
Belgian Congo	C		1				
British East Africa: Kenya	C	23	2				
Egypt	C	23,545	2,473				
Gold Coast	C		1				
Ivory Coast	C	4					
Morocco	C	25,846	67	24			
Nigeria	C	5					
Niger Territory	C	1					
Rhodesia (Northern)	C	[2] 1					
Senegal	C	3					
Sierra Leone	C	7					
Tunisia	C	16,295					
Union of South Africa	C	1,728	45				
ASIA							
Afghanistan	C	2,439			[3] 400	120	
China	C	369					
India	C	7	2	7			
Indochina	C	11					
Iran	C	902					
Iraq	C	105	13				
Palestine	C	206	13				
Syria and Lebanon	C	27	3				
Trans-Jordan	C	8					
EUROPE							
Bulgaria	C	709	99				
Czechoslovakia	C	17					
France:							
Seine Department	C	1					
Unoccupied zone	C	229					
Germany	C	[4] 2,043					
Great Britain	C	1					
Hungary	C	827	60	7		[5] 25	
Irish Free State	C	29					
Portugal	C	1					
Rumania	C	3,992	225				[6] 982
Slovakia	C	6	[7] 30	[5] 15	17		
Spain	C	3,870	56				
Canary Islands	C	1					
Switzerland	C	3					
Turkey	C	427	167				
Union of Soviet Socialist Republics	C	67					
NORTH AMERICA							
Guatemala	C	251	71				
Jamaica	C	53	2	2			
Mexico	C	978	110				
Panama Canal Zone	C	1					
Puerto Rico	C	4					
SOUTH AMERICA							
Chile	C	128	7				
Colombia	C	70					
Ecuador	C	171	31		5		
Peru	C	923					
Venezuela	C	25					
OCEANIA							
Australia	C	42	2	2			
Hawaii Territory	C	49	3				

[1] For the period Feb. 1–10, 1943.
[2] Suspected.
[3] For the approximate period Jan. 8 to Feb. 13, 1943.
[4] In German territory as of 1919.
[5] For 2 weeks.
[6] For the month of February 1943.
[7] For 3 weeks.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January–December 1942	January 1943	February 1943—week ended—			
				6	13	20	27
AFRICA							
Belgian Congo: Libenge	D	[1]2					
British East Africa: Kenya	C	1					
French West Africa	C	1					
Gold Coast	C	[2]3					
Ivory Coast	C	[2]7					
Nigeria	C	2					
Senegal [3]	D	1					
Sierra Leone: Freetown	C	2					
Sudan (French)	D	[1]2					
Togo	C	2					
SOUTH AMERICA							
Bolivia:							
Chuquisaca Department	D	1					
La Paz Department	C	7					
Santa Cruz Department	C	18					
Brazil:							
Acre Territory	D	4					
Bahia State	D	1					
Para State	D	1					
Colombia:							
Boyaca Department	D	5					
Cundinamarca Department	D	4					
Intendencia of Meta	D	5	1	1			
Santander Department	D	4					
Venezuela: Bolivar State	C	2					

[1] Includes 1 suspected case.
[2] Includes 2 suspected cases.
[3] According to information dated Feb. 9, 1942, 15 deaths from yellow fever among Europeans have occurred in Senegal.

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