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ENGINEERING PROBLEMS IN MILK SANITATION

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Introduction.—Until fairly recently sanitary engineers have not considered that milk sanitation was a problem with which they should much concern themselves. Conclusive evidence of this may be seen in the past curricula of sanitary engineering courses. Practically none of the graduate sanitary engineers in the field today included a study of milk sanitation in their undergraduate courses.

Indeed, milk sanitation has in the past been considered to be a problem for veterinarians, bacteriologists, and epidemiologists rather than for engineers. Milk is an animal product and its sanitation is related to the health of animals. Therefore milk sanitation is a problem for veterinarians. It is advisable to make bacteriological analyses of milk. Therefore milk sanitation is a problem for bacteriologists. Epidemics occur as a result of unsafe milk supplies. Therefore milk sanitation is a problem for epidemiologists. This has been the philosophy of milk control in the past and such was the status of milk sanitation until 20 years ago and even later. Two decades ago only one or two State sanitary engineering divisions were interesting themselves in milk control In fact, the States in general were doing little, if any, real milk sanitation work. Actual enforcement of milk regulations was then, and still is, primarily a function of city health departments, but not a single city at that time employed a sanitary engineer in connection with milk sanitation work.

As time has gone on, however, it has become increasingly apparent that milk sanitation is not exclusively a problem for veterinarians, bacteriologists, and epidemiologists. The conviction has steadily grown that the pasteurization of all market milk supplies, essentially an engineering problem, is a vital necessity. This is because we have learned that no other measure and, in fact, no combination of other measures, gives adequate protection.

Tuberculin testing and other tests of the health of animals nearly, though not entirely, remove the bovine tuberculosis menace and reduce the danger from undulant fever, but these measures do not protect against streptococcic udder infections, nor against other milk-borne disease organisms which may enter the milk after it has been drawn from the udder.

Health examinations of employees are valuable, but fail to eliminate completely the typhoid fever carrier and are relatively ineffective in preventing the contamination of milk with the organisms of septic sore throat, scarlet fever, and diphtheria. The cleaning and sterilization of containers and utensils offer valuable protection against disease organisms which may reach the milk from equipment, but cannot eliminate disease organisms which enter the milk before it comes in contact with the equipment, nor prevent subsequent contamination of the milk through spittle droplets, dust, or flies.

In short, pasteurization is the only public health measure which, if properly applied, will adequately protect against all infectious milk-borne disease organisms which may have entered the milk prior to pasteurization. Obviously the milk must be protected against recontamination.

This growing conviction of the all-importance of pasteurization has been reflected in an increase in the percentage of milk pasteurized. Thus, while at the beginning of the century the percentage of milk which was pasteurized in this country was negligible, by 1936 it had risen to 83 percent for communities of 10,000 population and over, and to nearly 75 percent for communities of 1,000 population and over. Such acceptance by the people of this country of the milk sanitation advice of their public health authorities should be profoundly stimulating.

The use of the pasteurization process at once poses problems of the design and operation of pasteurization equipment and it is at this point that the wisdom of adding sanitary engineers to the milk sanitation staff becomes sharply apparent. This has become particularly true since the advent of automatic pasteurization systems, as will be made clear later on in this paper in discussing the problems of thermostatic control, milk-flow stops, valve design, air and foam heater design, regenerator design, and similar problems.

However, the function of the sanitary engineer is not limited to the immediate problem of pasteurization. His work really begins at the producing farm. It may be of interest to trace the path of milk control and processing and point out the more important items to which the sanitary engineer should devote attention.

Dairy barn and milk house design.—One of the first items with which the sanitary engineer should concern himself is the design of the dairy barn and milk house, the drafting of plans which will insure that there is adequate space to prevent contamination due to overcrowding, adequate light to insure cleanliness, adequate ventilation to prevent the absorption of odors and flavors and the drip from condensation on the ceiling, proper construction of floors and walls to promote easy cleaning, and proper arrangement to facilitate the required sequence of operations.

Dairy farm water supplies.—The next item which should receive the attention of the sanitary engineer is the design and construction of dairy farm water supplies. Six and one-half pages of the Public Health Service milk code are devoted to this item alone. The subject is important because of the intimate relationship between dairy farm water supplies and the process of milk production. Contaminated water supplies would mean that the slightest relaxation or accident in the bactericidal treatment of milk utensils and equipment which had been washed in the dairy farm water supplies might be disastrous. It is only recently that intensive attention has been devoted to dairy farm water supplies, even in the Public Health Service milk code. As a result, until about 1933 or thereafter, local milk inspectors paid insufficient attention to farm water supplies.

Dairy farm excreta disposal.—In most cases water carriage of excreta is not resorted to on dairy farms. Instead, sanitary privies of the pit type are widely used and while such privies are relatively simple their design and construction are within the province of the sanitary engineer. In some cases, too, farms desire to use a water carriage system of excreta disposal and in these cases the sanitary engineer should be called upon to give advice.

Pasteurization plant design.—The next problem to which the attention of the sanitary engineer is being directed is that of pasteurization plant design. Here again, as in the case of dairy barn and milk house layout, we have the problems of adequate light and ventilation, proper construction of floors, walls, and ceilings, proper drainage, proper layout to separate the milk receiving and utensil cleaning processes from the pasteurization and subsequent operations, so as to avoid cross-contamination, and the proper design and installation of milk receiving, filtration or clarification, pasteurization, cooling, and bottling equipment.

The engineering divisions of several State boards of health have devoted some attention to the drafting of plans for pasteurization plants. Figure 1 shows a plant developed by the sanitary engineering division of one of the Southern States, namely, North Carolina. In that State the division offers its services to milk distributors who are contemplating the construction or reconstruction of a plant.

This calls attention to another and even more recent development. In the 1939 edition of the Public Health Service milk code will appear the requirement that plans for all dairies and milk plants which are hereafter constructed, reconstructed, or extensively altered shall be submitted to the health officer for approval, and the further requirement that in the case of milk plants signed approval shall be obtained from the State health department. This requirement will parallel the similar requirement long existing in many States that plans for water and sewage structures must be approved by the State health department. It is reasonable to believe that in the future it will be a routine matter for sanitary engineering divisions of State boards of health to be required to pass upon all plans for pasteurization plant construction or reconstruction.

Pasteurization plant water supplies.—At first thought it might be assumed that nearly all pasteurization plants use public water supplies exclusively and therefore do not require the special attention of the sanitary engineer, since public water supplies are presumably already within his jurisdiction. However, a number of pasteurization plants are located beyond city limits and have their own independent water supplies. In addition, a large number of plants make dual use of both an independent and a public water supply, and frequently have them cross-connected. Therefore, each such plant should be studied by the sanitary engineer to determine whether such independent water supplies as are used are safe, and whether there is any cross-connection with the public water supply.

Plumbing.—Pasteurization plant plumbing constitutes another important sanitary engineering problem. In 1935, W. Scott Johnson read an excellent paper on plumbing hazards in pasteurization plants before the engineering section of the American Public Health Association. In that paper he described the results of a plumbing survey of six pasteurization plants located in the city of St. Louis. He described the finding of 210 separate plumbing defects involving 28 different kinds of milk plant equipment and including direct pipe connections between potable water supplies and sewage or contaminated water supplies, potable water inlets submerged so as to permit back siphonage during intervals of negative head, sewer lines located above pasteurizers or other milk processing equipment, instances of potential aerial pollution, and faulty drinking fountains.

Pasteurization plant excreta and waste disposal.—This problem does not often engage the attention of a sanitary engineer, as in the majority of instances pasteurization plants are connected with a public sewer. However, some plants are located outside the public sewer districts and in these instances special sewage treatment plants must be designed. This may require experience beyond the ordinary problems related to excreta disposal, as special consideration must often be given to the treatment of dairy wastes other than excreta. In the past the solution of this problem has often been unsatisfactory both because of the composition of dairy wastes and because of their extreme variability in amount and kind during a single 24-hour period. For example, within a period of a few hours the waste may vary from

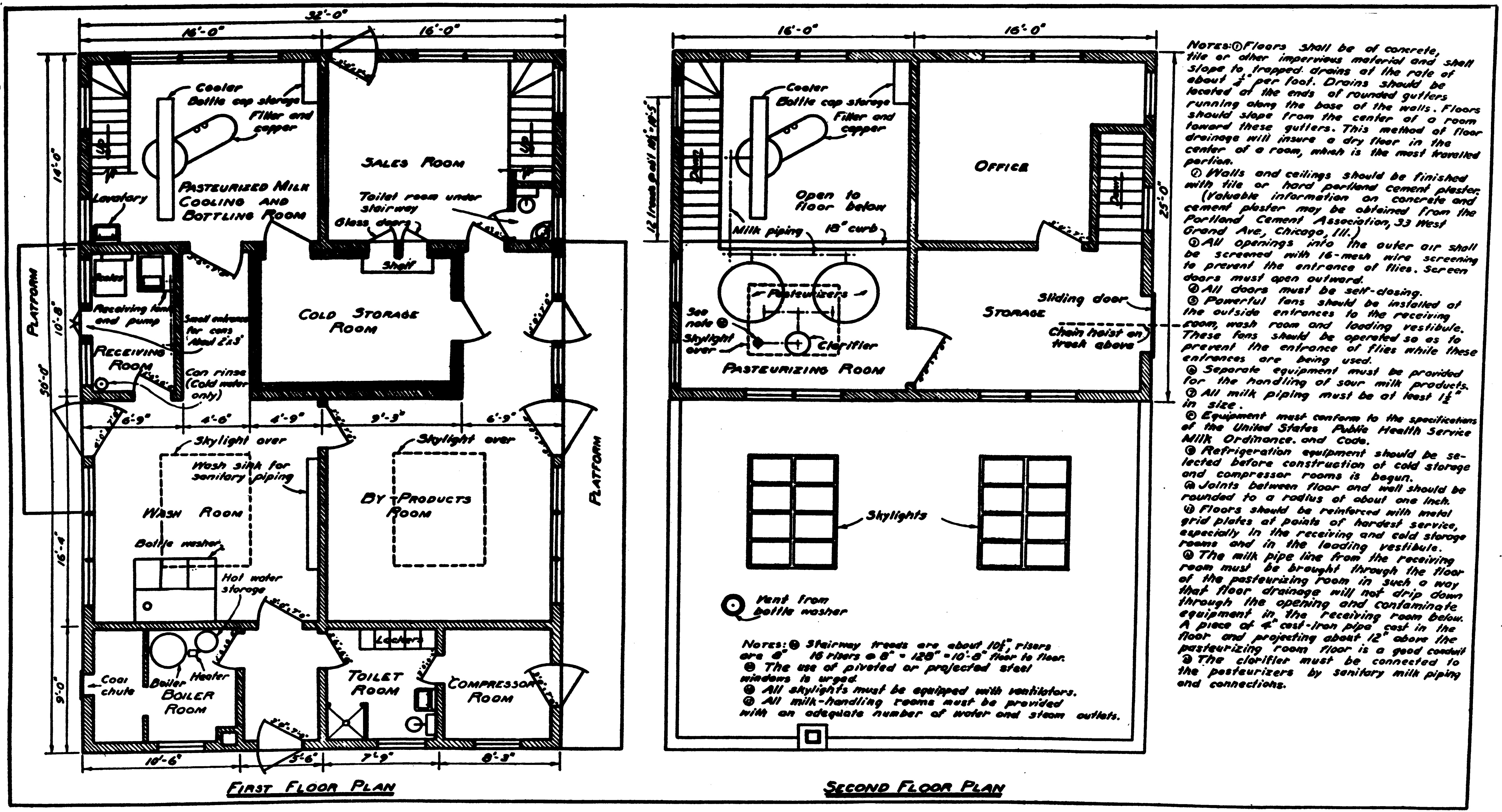

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FIGURE 1.—Pasteurization plant design prepared by Sanitary Engineering Division of North Carolina State Board of Health.

butter-milk vat drainage of low pH to the relatively caustic drainage from a bottle washing machine.

Design and operation of regenerators.—We have here a problem which involves an engineering study of relative pressures in various parts of a heat-exchange system. A regenerator, as understood by the milk industry, is simply a heat exchanger which is designed to permit the incoming cold raw milk to recapture some of the heat from the outflowing hot pasteurized milk. The regenerator may be either of the "tube within a tube" type with the heat exchange taking place between the milk in the inside tube and the milk between the inside and the outside tubes, the latter flowing counter-current to the former; or the regenerator may be of the plate type, which consists of a series of adjacent plates separated by gaskets and with a flow system so designed that the cold raw milk and the hot pasteurized milk flow in alternate layers between the plates. Again either of these two constructions may be employed but so arranged that the pasteurized milk transfers its heat to a circulating water medium which in turn warms the raw milk.

In either case the problem arises that if leakage develops in the metal separating the raw from the pasteurized milk, or separating the milk from the heat-transfer medium, and simultaneously the raw milk is under higher pressure than the pasteurized milk or the circulating medium, then the raw milk may contaminate the pasteurized milk. For example, such higher raw-milk pressures are often encountered because of the customary practice of placing the milk pump upstream from the raw side of the regenerator.

The solution, obviously, is to develop design, installation, and operation specifications to insure that the pasteurized milk side of the regenerator is under higher pressure than the raw milk side whenever there is any raw milk in the regenerator, including not only the routine flow period but also at the beginning of the day's run and during interruption periods, when the pressure picture may be quite different. Such specifications have been worked out in detail and have already been described.[1]

The solution involves not only the proper placing in the flow line of milk pumps and heat transfer medium pumps so as to take proper advantage of the differential between suction and discharge pressures, but also proper elevations for the free milk levels upstream from and downstream from the regenerator so that proper relative pressures may obtain during shut-downs. In addition, in certain designs it is necessary that hot water, chlorine solution, or previously pasteurized milk must, at the beginning of the day's run, be introduced into the pasteurized milk side of the regenerator before raw

[1] Fuchs, A. W.: Contamination of pasteurized milk by improper relative pressures in regenerators. Pub. Health Rep., 53: 496 (1938). (Reprint No. 1921.)

milk is admitted to the raw milk side. Otherwise the raw milk side may at this time be above atmospheric pressure and the pasteurized milk side at atmospheric pressure. Figure 2 shows an illustrative flow chart designed to insure that the relative pressures in the regenerator will always be such as to prevent contamination of the pasteurized milk by the raw milk.

Special problems relating to the requirement of the definition of pasteurization that every particle of milk shall be brought to the full pasteurization temperature and held thereat for the full holding time.—This brings us to the aspect of milk sanitation which has introduced the most serious

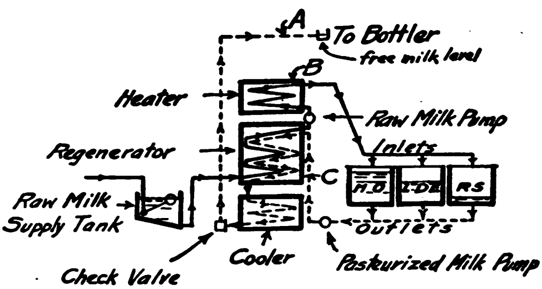


FIGURE 2.—Example of lay-out to insure proper regenerator pressures.

—→————→—=Raw milk.

—←- - - - - -←—=Pasteurized milk.

Raw milk supply tank overflow is lower than lowest raw-milk point in regenerator, hence insures negative raw-milk pressures.

Raw-milk pump sucks raw milk through regenerator to heater and holders.

Pasteurized-milk pump forces pasteurized milk through regenerator, cooler, and check valve to point *A* in pasteurized-milk line which is above highest raw-milk point *B* by at least 3 percent of difference in elevation between *B* and lowest raw milk regenerator point *C*, thus maintaining proper relative pressures during shut-downs.

Check valve prevents reduction of pasteurized-milk pressures during shut-downs.

sanitary engineering problems. Only a few years ago this subject seemed to offer no problem at all. The pasteurization of milk was considered to be an extremely simple process and few milk control officials thought it involved engineering problems. Milk was merely introduced into a simple vat, then brought to the required temperature by means of a revolving hot water coil, or otherwise, held for 30 minutes, and then discharged. Temperature was shown by a simple indicating thermometer.

Then health authorities began to ask for evidence as to what had been the temperature of the batches of milk which had been pasteurized during the intervals between inspections. As a result recording thermometers were substituted for the indicating thermometers. It was soon discovered that the recording thermometer was not as reliable an instrument as the indicating thermometer, and that the actual milk temperature was frequently seriously below the recorded temperature. So we began to require the use of both indicating and recording thermometers, the more reliable indicating thermometer to serve as a check upon the recorder.

Simultaneous temperature differences in the holder, and close-coupled or flush-type valves.—It was discovered that the temperature of the milk at the recording and indicating thermometer bulbs might be and frequently was higher than the temperature of the milk in other parts of the holder, e. g., the zone between the face of the outlet valve and the main body of the milk. The milk in such outlet zones was frequently found to be 10° F. or more below the temperature of the main body of the milk. As a result of this finding the requirement was inserted in the milk code recommended by the Public Health Service that the design of the holder shall be such that simultaneous temperature differences between various points in the holder will be limited to a tolerance of not over 1° F. Furthermore all outlet valves

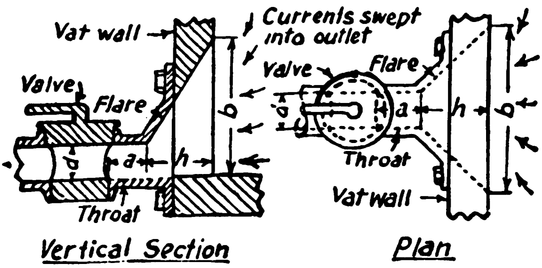


FIGURE 3.—Close coupled side outlet valve connected to holder, showing design requirements.
d=diameter of outlet.
h=depth of flare.
a=greatest distance from valve seat to small end of flare (shall be not more than 1½*d*).
b=smallest diameter at large end of flare (shall be not less than *h*+*d*).

are required to be of the flush or close-coupled type, that is, so designed as to bring the face of the outlet valve close enough to the main body of the milk in the vat to eliminate the "cold pocket" at the outlet.

Figure 3 illustrates a close-coupled valve of satisfactory design for holders in which properly designed agitators are employed, and which sweep the milk currents into the outlet.

Leak-protector valves.—It was also discovered that since practically all milk valves were of the metal seat type, and since practically all metal seat valves leak sooner or later, owing to such causes as scoring during cleaning, there was real danger that raw milk in the vat would leak out through the outlet valve into the pasteurized milk line before it had been completely pasteurized. It was also discovered that raw milk might leak through the inlet valve and recontaminate the milk in the vat while it was being pasteurized. So the Public Health Service inserted a requirement in its recommended milk code that all inlet and outlet valves must be of the leak-protector type, that is, so designed as to divert to the outside, by means of leak grooves or otherwise, any leakage which attempted to pass the valve face.

Satisfactory types of valves were developed both by the Public Health Service engineering staff and by the industry and are described on pages 88 to 97 of the Public Health Service milk code. Figure 4 illustrates one type of leak-protector valve.

Milk foam.—Approximately simultaneously with the above development it was also found, and should have been anticipated, that the

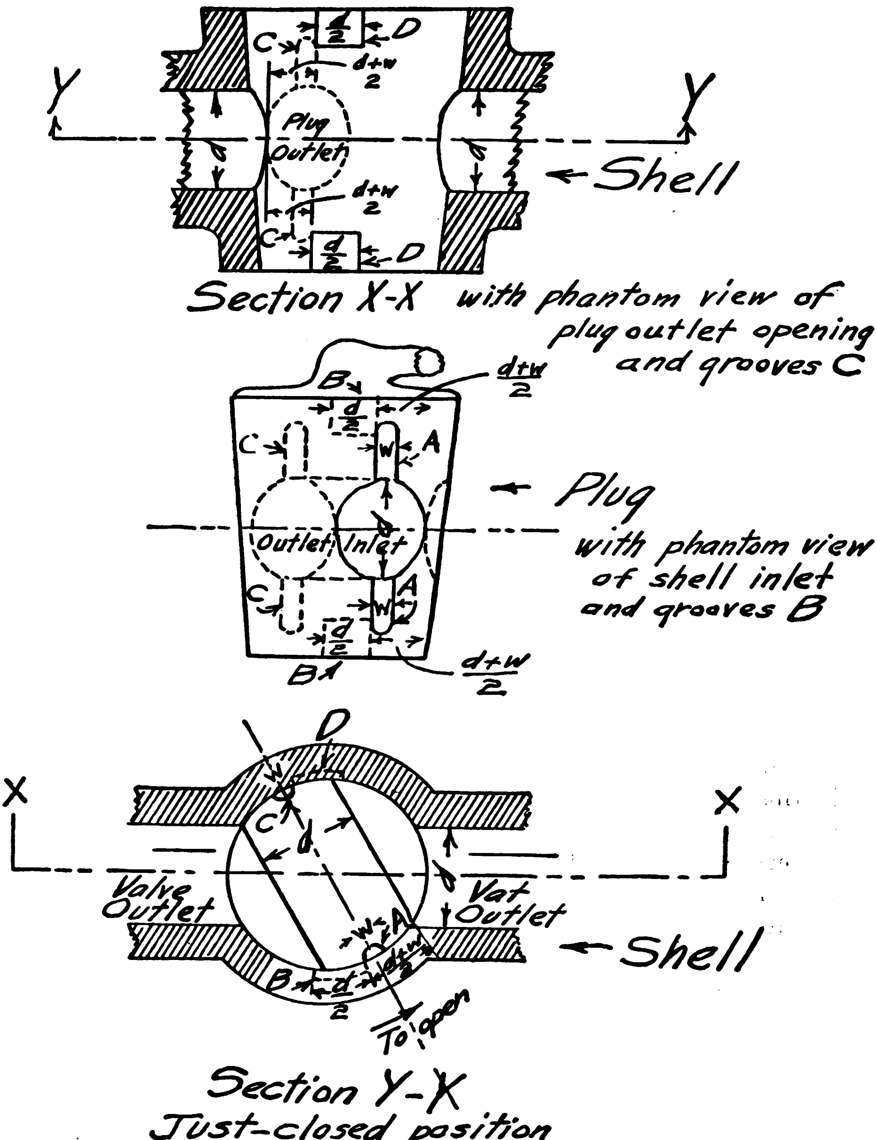


FIGURE 4.—Example of leak-protector valve (outlet type).

foam which may be formed on the surface of the milk in a vat is likely, unless preventive measures are employed, to be colder than the main body of the milk, and this fact not be evident from the record of the temperature shown on the recording thermometer chart. Foam temperatures as much as 20° F. below the temperature of the milk proper have been encountered during studies made by the Public Health Service. Therefore it became necessary to develop means of heating or dissipating the milk foam. Our studies developed the fact that while radiant or convection heating of the air above the milk by means of electric or enclosed steam heaters was not very satisfactory because of the tendency of the dry hot air to rise away from the foam and thus not heat it, live steam admitted to the air space above the milk tended not only to heat the foam as it was formed but also to dissipate it. It was necessary, of course, to design the apparatus so as to prevent the discharge into the milk of either steam-line sediment or a significant amount of steam condensate. Furthermore, since the amount of steam required was very small it was necessary to increase the sensitivity of the throat of the throttle valve to the maximum by placing a resistance in the line in such manner as to reduce the differential pressure on the two sides of the valve. This took the form of a small orifice placed downstream from the valve.

Figure 5 illustrates an air space heater as developed by the Public Health Service.

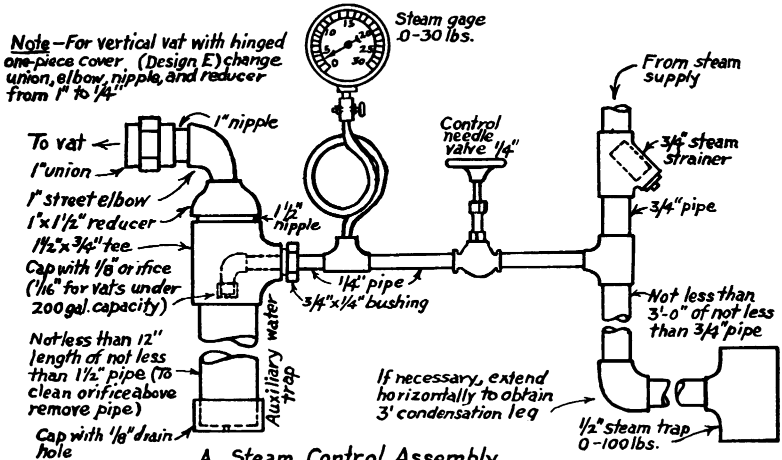
Insurance of full holding time in manual vats.—Further studies showed that even when the recording thermometer charts indicate that the milk in the vat has been held at the required temperature for the full holding time it might nevertheless be true that the holding time is less than the required holding time. Suppose, for example, that the milk is discharged from the pasteurization vat at the pasteurization temperature. It may take 10 minutes or longer for the descending milk level to drop to the recording thermometer bulb. During this interval the recording thermometer will continue to show the pasteurization temperature. Later, when the milk control official inspects the charts, which are required to be preserved for his inspection, he may find charts which show 143° F. for the full required 30-minute period and yet some of the milk will have been discharged from the vat to the cooler after only 20 minutes holding. For this reason the Public Health Service milk code now requires that if cooling is begun in the holder after the opening of the outlet valve, or is done entirely outside of the holder, the recording thermometer charts shall show not merely 30 minutes, but 30 minutes plus the emptying time down to the level of the recording thermometer bulb.

Automatic pasteurization systems.—Automatic pasteurization is rapidly replacing manual pasteurization, particularly in the larger plants. This trend, as might be expected, is introducing a whole series of sanitary engineering problems. In the case of the relatively simple manually operated vats, if the design requirements previously described have been satisfied, and if the thermometers show that the pasteurization temperature has been applied for the full holding time, the operator can open the outlet valve and discharge the milk with the assurance that it has been properly pasteurized. If the recording thermometer does not show both the required temperature and the required holding time he can either increase the temperature or the holding time, or both, before opening the outlet valve. The point is that the milk is not discharged to the cooler and bottler until the operator deliberately opens the outlet valve. It is his duty and he always has the opportunity to assure himself that the process has been properly applied before he opens the valve.

In the case of automatic pasteurization, however, both admission to and discharge from the holder are automatic and unless otherwise prevented will take place *even if the milk has not been brought to the proper temperature or held at that temperature for the proper time.* Furthermore, since the holding time is automatically controlled, any temperature failure in the holder would require emergency manipulation of the automatic time control, or diversion of the entire supply back to the heater until the temperature failure had been corrected. This, in the case of batch-type holders, would be extremely hazardous because of the quantity of milk which would be required to be repasteurized and the ever-present temptation on the part of the operator to shirk the responsibility in order to save time. In these cases it has been considered fundamentally necessary, in the formulation of the Public Health Service milk code, to surround all automatic pasteurizers with all necessary safeguards to insure that the likelihood of either temperature or holding time failure will be reduced to the minimum.

Thermostatic control.—Accordingly the first requirement which has been laid down in the Public Health Service milk code is that all automatic systems must be provided with thermostatic control of the temperature of the milk entering the holder. This requirement has further been expanded, for purposes of convenience, and in order to avoid what might be termed "hay-wire" pasteurization, to include any system in which the milk is brought to the pasteurization temperature before it enters the holder. Obviously it would be possible to have an operator continuously present at a temperature control valve as a substitute for thermostatic control, but while this might give good results most of the time, it is obvious that the slightest lapse in attention would result in the passing of unsafe milk.

Automatic milk-flow stops.—Next, since even the best thermostatic control occasionally fails, it was considered highly advisable to include an additional safeguard which would function at such times and serve as an extra factor of safety. After considerable thought it appeared that the best such safeguard would be a device which would automatically halt the flow of milk beyond the holder if the thermostat



A. Steam Control Assembly
(Uniform for all installations except as noted above)

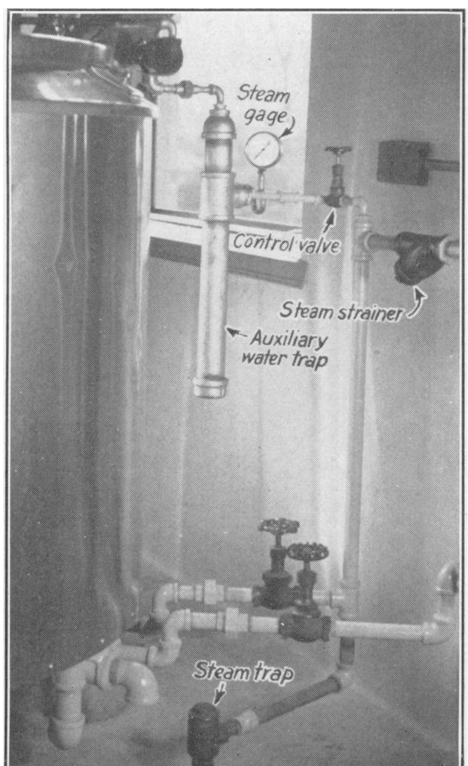


FIGURE 5.—Air-space heater (to heat and dissipate foam).

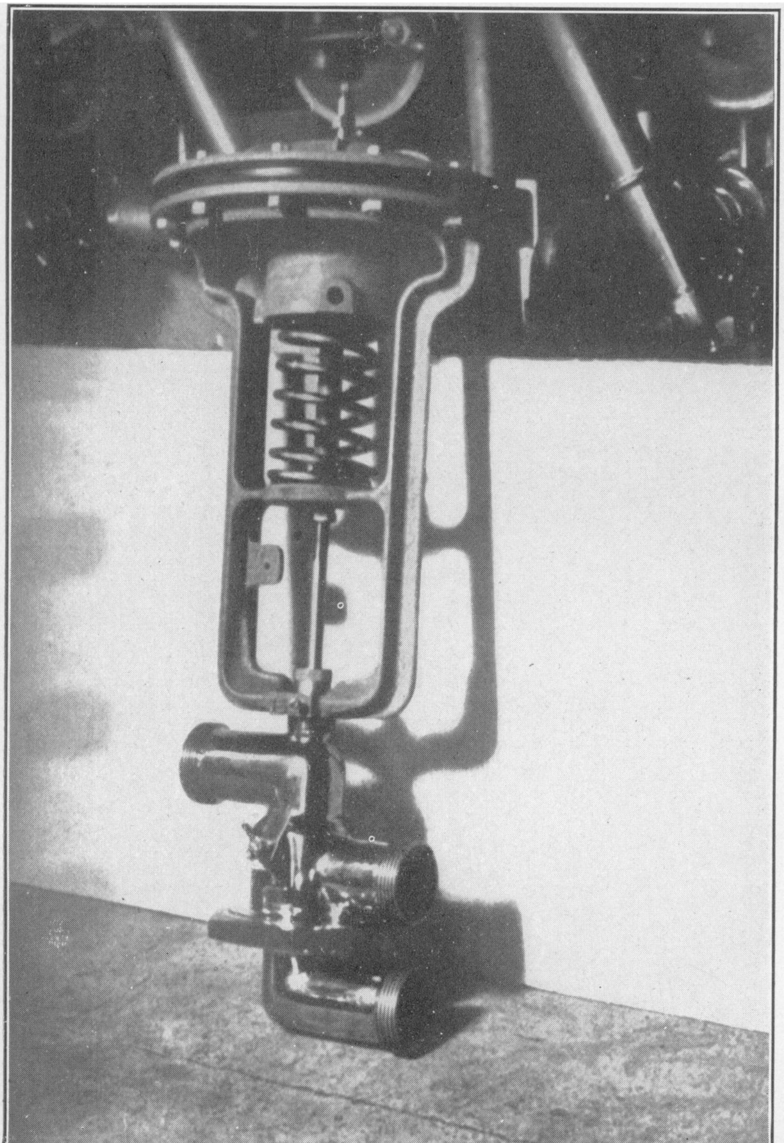


FIGURE 6.—Flow-diversion valve.

failed or if any temperature drop occurred in the holder. It was soon found that such a "milk-flow stop" could take either of two forms:

(1) An automatic milk pump stop which would automatically stop the milk pump motors whenever the milk temperature dropped below the pasteurization temperature and automatically restart the motors whenever the required milk temperature was again reached, or

(2) An automatic milk-flow diversion device which would automatically divert the milk away from all downstream points whenever its temperature dropped below the required pasteurization temperature, and automatically reestablish forward flow when the milk again reached the required temperature.

Figure 6 illustrates an automatic flow stop of the diversion valve type.

The requirement that a milk-flow stop be installed immediately brought into focus two collateral problems, namely:

(1) What should be included in the specifications for "milk-flow stops"? and

(2) Where should they be required to be located?

After careful study a set of specifications for milk-flow stops was inserted in the Public Health Service milk code. These include (*a*) the sealing of the milk-flow stop setting so as to insure that any change in the setting will come to the attention of the health officer, (*b*) the prohibition of manual switches which would permit cutting out a milk-pump stop, (*c*) the prohibition of any bypass, (*d*) required routine daily tests for cut-out and cut-in temperatures, (*e*) the requirement that failure of the primary motivating power will automatically stop or divert the flow, (*f*) the requirement of leak-protector features on all flow-diversion valves, (*g*) the requirement that the actuating bulb of the flow-diversion device shall be located immediately upstream from the valve, and (*h*) a limitation of thermometric lag, and routine tests required to determine its magnitude.

With reference to the location of the milk-flow stop it became apparent that if the holder system is so designed that the milk therein can neither increase nor significantly decrease in temperature between the time it leaves the heater and the end of the holding period the milk-flow stop may safely be located either upstream from or downstrean from the holder.

If, on the other hand, the holder is provided with a supplementary heating device intended to insure that all zones will remain at or above the pasteurization temperature, it is necessary that a milk-flow stop be located upstream from the holder, as otherwise milk might enter the holder below the pasteurization temperature, be raised to or above the pasteurization temperature during the holding period by the supplementary heating device, and thus pass the milk-flow stop with impunity if it were located downstream from the holder.

Again, if the holder is so designed that some of the milk may drop significantly in temperature before the end of the holding period it is considered necessary that a flow stop be located downstream from the

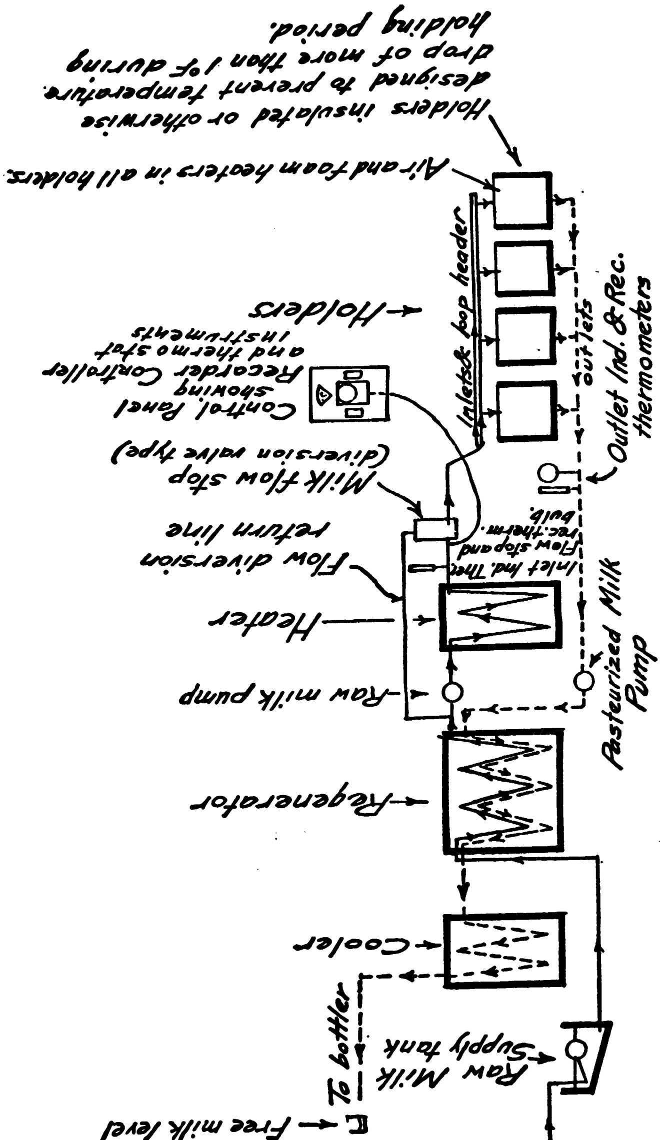


FIGURE 7.—Automatic pasteurization system with thermostatic control and flow-diversion valve (diagrammatic elevation).

holder, as otherwise milk may enter the holder at the pasteurization temperature, drop below it during the holding period, and thus have passed the milk-flow stop with impunity if it were located at the inlet to the holder and not at the outlet.

Finally, if the holder is so designed that the milk in it may either rise in temperature or drop significantly in temperature before the end of the holding period, it is, of course, necessary to require a milk-flow stop both upstream from and downstream from the holder.

Figure 7 illustrates a flow diagram for an automatic 30-minute pasteurizer of the multiple-holder type, with a flow-diversion valve located upstream from the holder.

It at once becomes apparent that the above specifications are dependent for their effectiveness upon a proper definition of "significant temperature drop." After careful consideration this term was defined in such manner as to allow a temperature drop of not more than 1° F. when only automatically controlled holder heaters are turned on during the holding period, and of not more than 2½° F. even if all automatically controlled holder heaters cease functioning at the beginning of the holding period. Automatically controlled holder heaters are defined as heaters which are connected with an upstream milk-flow stop in such manner as to stop the flow of milk into the holder when the heating medium drops below the temperature required to keep the milk throughout the holder at the required temperature.

Further study showed the necessity for a number of special requirements for systems in which the milk-flow stop is located upstream from the holder, and other special requirements for systems in which the milk-flow stop is located downstream from the holder. To give the details of these special requirements would undesirably expand this paper.

There are, obviously, also special requirements with reference to time control for automatic systems. These include requirements relative to the use of constant-speed motors or limited maximum-speed motors on milk pumps and timing devices, the prevention of interpocket flow, the prevention of air or gas accumulation in tubular or equivalent stream-flow holders, and the checking of the holding time by means of dye tests, or otherwise, immediately after installation or after any replacement or alteration in design.

Conclusion.—Many details have necessarily been omitted in the above discussion, but enough has been said to demonstrate two important facts:

(*1*) *Milk sanitation is a problem which now requires and will in the future increasingly require the serious attention of sanitary engineers.*—It is rapidly becoming apparent to State boards of health that their sanitary engineering divisions should be related to the problem of milk sanitation. Information collected by the Public Health Service shows that in at least 25 States milk sanitation work is now being done by the divisions or bureaus of sanitary engineering, whereas two decades ago only one or two State sanitary engineering bureaus interested themselves in the problem. A similar tendency is beginning to appear in some of the local health departments. The total number of sanitary engineers engaged in milk control in this country is, at the time of this report:

(a) By State boards of health—17 full time and 75 part time, and

(b) By local boards of health—14 full time and 36 part time.

This paper should not be understood to imply that only public health engineers should be employed in milk sanitation. That would be as unwise as to insist that only veterinarians, only bacteriologists, only epidemiologists, or only dairying graduates should be employed in this field. Nor should this paper be understood to imply that all milk sanitation work must necessarily be under the administrative direction of a sanitary engineer. The capacity for administration does not reside solely in any one profession. If a State board of health employs more than one individual in milk control the one who shows the best administrative capacity should be placed in administrative charge, irrespective of whether he is an engineer, veterinarian, bacteriologist, epidemiologist, or dairy expert.

Nevertheless it seems inescapable, from the facts presented in this paper, that every State health department, without exception, should employ at least one sanitary engineer full time on milk sanitation work and, where possible, the milk control work should be a function of the State sanitary engineering division. Except in the case of large cities which employ their own sanitary engineers, no pasteurization plant should be constructed or reconstructed and no pasteurization equipment should be installed or modified without the approval of the milk sanitation engineer. His services should be available to all city health departments in connection with the interpretation of any item of sanitation which is of an engineering character, and he should be prepared to give the city health departments advisory assistance in connection with the testing of holding time, thermometric lag, the approval of indicating and recording thermometers, milk-flow stops, regenerators, and similar problems. In addition, the services of the sanitary engineer should be available on all other items previously referred to in this paper, such as the sanitation of water supplies, excreta disposal, dairy wastes disposal, and the like.

(2) *Sanitary engineers should be adequately trained to discharge their milk sanitation functions.*—It has been emphasized in this paper that the sanitary engineers of this country face a grave responsibility in connection with milk sanitation. As evidence of the magnitude of this responsibility, a survey conducted by the Public Health Service for the year 1936 developed the fact that in communities of more than 1,000 population over 5,000,000 gallons of milk per day, or over 1,800,000,000 gallons of milk per year, are pasteurized. To insure that no part of this ocean of milk may transmit disease is a problem of such magnitude that it is not too much to ask that the future

graduate sanitary engineers who will engage in this work be properly trained for it. It is still true that most of the sanitary engineers who graduate today are without the necessary specialized training, and it is believed that every institution which prepares men for the sanitary engineering field should consider the desirability of including milk sanitation as one of the subjects of instruction.

Those sanitary engineers who have already graduated and who are now engaged in or may in the future wish to undertake milk sanitation work should either attend post-graduate courses in milk sanitation or one or more of the milk sanitation short courses or seminars which are being conducted by various State boards of health and the Public Health Service.

INDUCTION OF CARDITIS BY THE TREATMENT OF INFECTED GUINEA PIGS WITH INSULIN [1]

By MARK P. SCHULTZ, *Surgeon*, and EDYTHE J. ROSE, *Associate Bacteriologist, United States Public Health Service*

It has been demonstrated that treatment with thyroxin or desiccated thyroid induces nonpurulent carditis in infected rabbits and guinea pigs (*1*). Evidence has also been presented that the increased metabolic rate associated with scurvy is probably a factor in rendering infected, scorbutic guinea pigs susceptible to the development of heart lesions of a similar type (*2*). The purpose of the experiments reported here was an investigation of the influence of insulin upon cardiac pathology in infected rabbits and guinea pigs.

METHODS

Rabbits and guinea pigs were weighed daily at 11 a. m., after which they were fed oats, hay, Purina Rabbit Chow pellets and cabbage ad libitum. Protamine insulin [2] (40 units per cc.) was diluted 1: 20 with physiological saline immediately before use. In event of insulin convulsions, 5 cc. of 10 percent glucose were administered, intravenously to rabbits and intraperitoneally to guinea pigs, and the next dose of insulin withheld from the affected animal.

Rabbits were infected every third day with 17-hour cultures of a group A hemolytic streptococcus strain (C203) grown in "streptolysin" broth (*3*). The infecting doses were gradually increased from 5 to 20 0.1 cc. intracutaneous injections. Such culture inoculations provoked the formation of red, edematous papules which attained their maximum development in from 24 to 48 hours and usually regressed thereafter without becoming necrotic. In animals surviving over 10

[1] From the Division of Infectious Diseases, National Institute of Health.
[2] Zinc protamine insulin was generously supplied by the Eli Lilly Co.

days, cutaneous lesions became larger and more edematous—evidence of the development of bacterial hypersensitivity.

Guinea pigs were infected with a group C hemolytic streptococcus strain (GP–X) freshly isolated from a spontaneously infected guinea pig. Inoculations of 0.1 cc. of culture were made subcutaneously in inguinal and axillary regions twice weekly. A different site was selected for each successive injection. The hearts were fixed in Orth's solution, embedded in paraffin, sectioned and stained with a modified Romanowsky stain. Inguinal and axillary abscesses approximately 2 cm. in diameter, which occasionally broke down and discharged yellow pus, developed in all guinea pigs infected in this manner.

EXPERIMENT 1

Female rabbits were first selected as the experimental animal because of their high degree of sensitivity and uniformity of response to insulin (*4*). Twelve brown females, weighing 2,200 to 2,600 grams, obtained from a dealer, were apportioned into three groups and received treatment as follows:

Group A: Two untreated controls.

Group B: Two received insulin only.

Group C: Nine were infected and received insulin also.

The dose of insulin for the members of groups B and C was gradually raised from 3.5 to 4.75 units per kg. body weight daily, in four doses. Apportionment of the daily dose in such manner that a maximum quantity of insulin could be administered without provoking reactions was facilitated by determining blood sugar levels at hourly intervals, using the method of Miller and Van Slyke (*5*). The maximum, total, daily dose tolerated by most rabbits was 4.25 units, which it was found could most advantageously be apportioned as follows (doses per kg. of body weight): 8 a. m., 0.5 unit; 12 noon, 1.0 unit; 4 p. m., 2.0 units; and 11 p. m., 0.75 unit. At other dosage levels the totals were distributed in similarly proportioned fractional doses.

Results.—Members of group C survived from 1 to 4 weeks, but only two lived over 2 weeks. Those in groups A and B survived until the experiment was terminated after 28 days. All gained weight during the period of observation except for a terminal fall in some of the infected animals which succumbed. In earlier experiments, untreated rabbits, without exception, survived intracutaneous inocculations in comparable doses of culture of the strain of hemolytic streptococcus employed here. In the present experiment no evidence of a spread of infection from the local sites was obtained upon pathological examination in the gross or upon microscopic examination of the hearts. The high mortality in group C was, therefore, probably an insulin effect. The hearts of all the animals were negative except for the presence of minor microscopic lesions in members of each group. These changes closely resembled those previously described in stock rabbits (*1*).

EXPERIMENT 2

The results in experiment 1 indicated that female rabbits are probably unsatisfactory for experiments of this type because of their relatively high sensitivity to insulin. Eleven male guinea pigs of mixed stock, weighing between 350 and 450 grams, obtained from a dealer were, therefore, employed in a similar experiment. All were infected and all received insulin. With this species the daily dose of insulin was gradually raised during the course of the experiment from 3.25 to 6.75 units per kg. of body weight. Preliminary trials indicated that the total daily dose could most advantageously be divided into three parts, preserving the following relative proportions (for a total dose of 6.75 units): 8 a. m., 1.25 units; 12 noon, 2.25 units; and 4 p. m., 3.25 units. The animals were infected after the daily insulin dose had been gradually raised during a 10-day preliminary period to 4.75 units per kg. of body weight. Of the 11 infected, insulin-treated guinea pigs, 5 died in from 4 to 23 days, after being infected, while 6 survived until the experiment was terminated, after 28 days. Initial and terminal body weights of those succumbing were usually the same or indicated a slight loss, while those surviving until the end of the experiment gained from 50 to 200 grams each.

Results.—The hearts were negative to examination in the gross, but in those of five of the six animals surviving until the end of the experiment valvular and myocardial lesions similar to those demonstrable in scorbutic, infected guinea pigs were observed upon microscopic examination. At autopsy, however, no gross lesions suggestive of scurvy were apparent.

EXPERIMENT 3

In view of the positive results in experiment 2, a third experiment was planned, with employment of appropriate controls. To eliminate scurvy as a factor, each guinea pig was fed 40 to 50 grams of cabbage daily, and this portion was invariably consumed by those receiving insulin. This quantity would provide from 8 to 10 times the minimum requirement of vitamin C (*6*). In addition, the members of two insulin-treated groups each received 1.5 mg. of ascorbic acid subcutaneously in 0.5 percent solution three times a week. According to Göthlin (*7*), who determined the minimum oral protective dose of ascorbic acid, and to Hou (*8*), who investigated the relative efficacy of the subcutaneous and oral routes of administration, the quantities of this substance given in the present experiment should have sufficed exclusive of other sources of the vitamin, to prevent all scorbutic manifestations except microscopic dental changes. The total daily dose of insulin was gradually raised during the course of the experiment from 4.75 to 6.75 units per kg. Infection was instituted on the same day that insulin treatment was begun.

Thirty-five male guinea pigs of mixed stock weighing between 350 and 450 grams, obtained from a dealer, were apportioned into five groups and, in addition to the dietary provisions, received the following treatment:

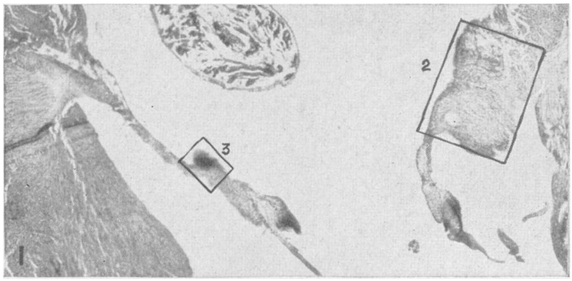
Group A: Five untreated controls.
Group B: Five received insulin only.
Group C: Five received insulin and ascorbic acid only.
Group D: Ten received insulin—were infected.
Group E: Ten received insulin and ascorbic acid—were infected.

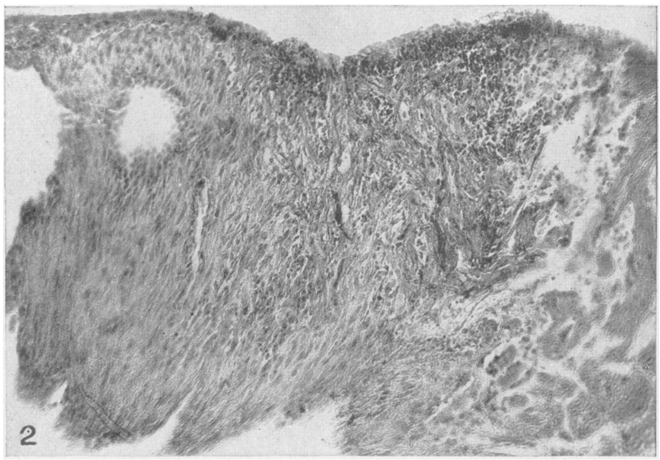
All the controls (group A) survived until the experiment was terminated on the 26th day; those in the other groups survived from 6 to 26 days. Within each group individual differences in weight fluctuation were slight except for terminal losses in animals succumbing to infection. Whereas the average daily weight gain in the control group (A) was 3 gm., it was 5.8 gm. in those treated with insulin only (group B). The infected animals (in group D), which were treated with insulin, showed an average daily weight gain of 2.5 gm. Only two members of the groups (C and E) which received ascorbic acid in addition to insulin, gained slightly during the period of observation. In most instances the weight of animals in the two latter groups was stationary with a terminal fall in many infected individuals.

PATHOLOGICAL CHANGES OBSERVED IN EXPERIMENTS 2 AND 3

No gross lesions suggestive of scurvy were observed. None of the animals was cachectic, while those in groups B and C appeared remarkably well nourished. The hearts were negative to examination in the gross. Except for the presence of minor pathological changes of a type previously described in stock guinea pigs (*9*), the hearts of members of Groups A, B, and C were negative.

The hearts of a few of the infected animals in both experiments were the seat of purulent inflammation. Small abscesses were sometimes macroscopically visible, while on microscopic examination polymorphonuclear and bacterial accumulations were found to be present in circumscribed and diffuse aggregations in the myocardium. About half the insulin-treated, infected animals of both experiments, however, in the absence of lesions of the character just described, developed nonpurulent carditis of a type similar to that observed in infected scorbutic guinea pigs (*9, 10*). There was endothelial and stromal proliferation in the valves; usually the mitral was affected. In the myocardium, perivascular infiltration with lymphocytes was common and





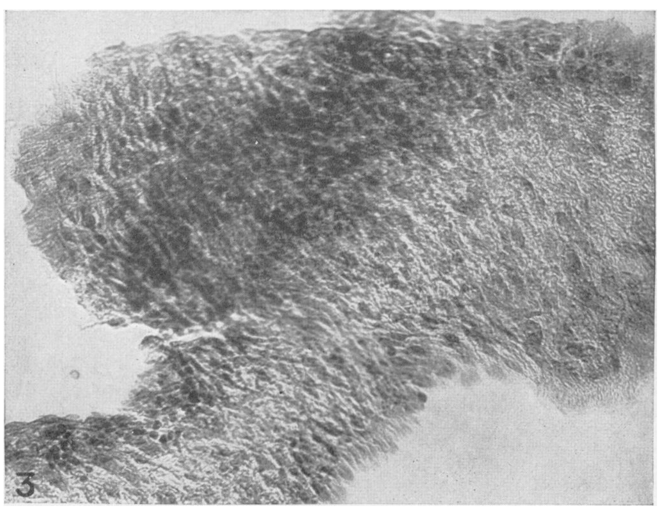
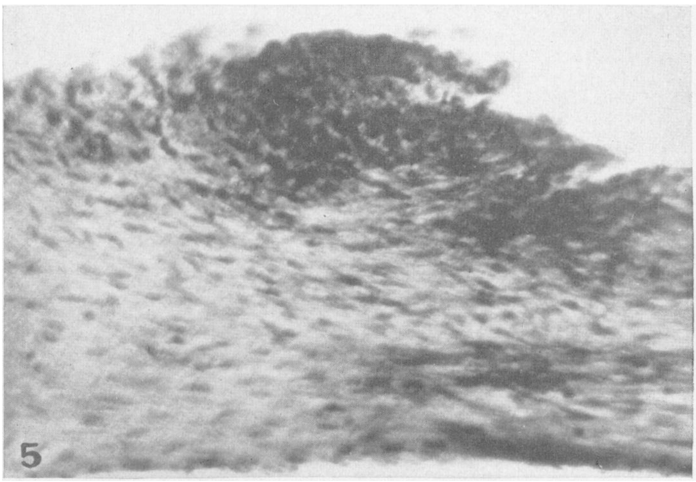


FIGURE 1.—Guinea pig 1-C-4. Killed after insulin treatment and infection for 30 days. Mitral valve, showing areas represented in greater detail in figs. 2 and 3. (×50.)

FIGURE 2.—Higher magnification of fig. 1. Stromal and endothelial proliferation in the mitral valve. Numerous young fibroblasts are present, with some lymphocytic infiltration. The endothelial layer has a thickness of several cells arranged in palisade formation. (×300.)

FIGURE 3.—Higher magnification of fig. 1. Proliferation in the mitral valve. There are large mononuclear cells of indistinct outline with faintly staining, round or oval, distinctly outlined nuclei. (×470.)



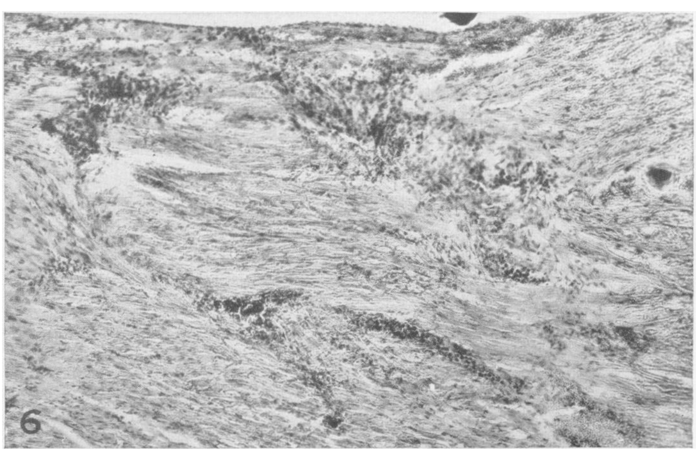
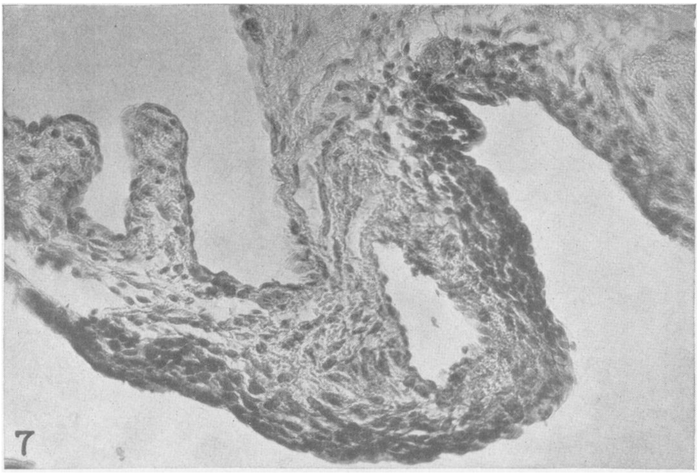
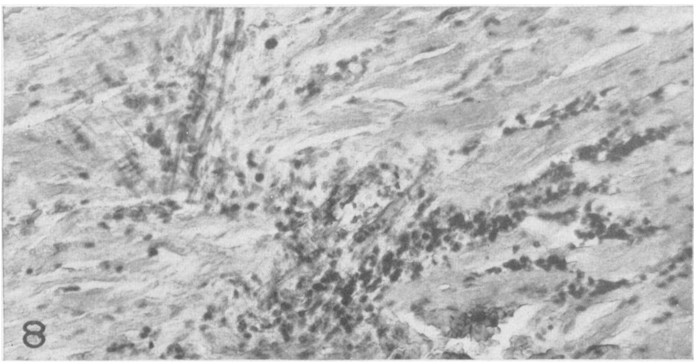


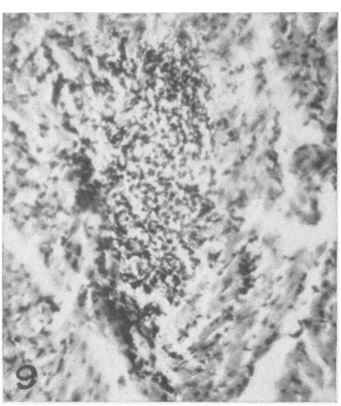
FIGURE 4.—Guinea pig 21–C–8. Died after 10 days of infection and insulin and ascorbic acid treatment. Mitral valve showing areas of proliferation, one of which is represented in greater detail in fig. 5. (×50.)

FIGURE 5.—Higher magnification of fig. 4. Localized area of endothelial proliferation in mitral valve. Endothelial cells are irregularly massed with disruption of the endocardial surface. (×480.)

FIGURE 6.—Guinea pig 23–C–8. Died after 9 days' infection, with insulin and ascorbic acid treatment. An area in the myocardium showing degeneration and loss of structural detail of myocardial fibers in some areas with localized accumulations of lymphocytes, chiefly perivascular. (×120.)







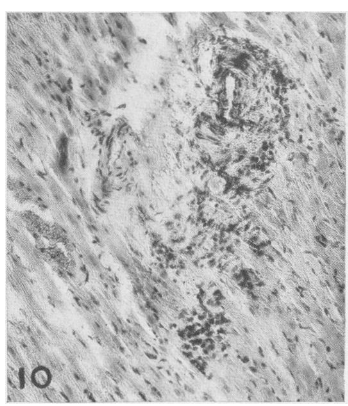


FIGURE 7.—Guinea pig 2–G–4. Killed after 30 days' infection and insulin treatment. Shows proliferation of the valvular endocardium along the line of closure of the mitral valve. (× 470.)
FIGURE 8.—From same animal as fig. 7. Perivascular lymphatic accumulations. (× 630.)
FIGURE 9.—Guinea pig 33–C–8. Died after 12 days' infection and treatment with insulin and ascorbic acid. Circumscribed area of myocardial degeneration. There are numerous lymphocytes, some amorphous detritus; no bacteria or polymorphonuclear leucocytes are present. (× 240.)
FIGURE 10.—Guinea pig 11–C–4. Killed after 30 days' infection and ascorbic acid treatment. Myocardial degeneration in the neighborhood of an arteriole. There is lymphocytic infiltration but no purulent inflammation. (× 160.)

focal lesions were occasionally seen in which the myocardial fibers had undergone degeneration, with small lymphocytes closely packed in the debris. Representative lesions are shown in the accompanying illustrations (1 to 10).

Analysis of the results did not indicate that the occurrence of convulsions could in any way be correlated with the pathological findings. Hypoglycemic convulsions were observed in only one-fourth of the animals, and the incidence of the various types of cardiac lesions was apparently not affected by this circumstance.

A control group of guinea pigs subjected to infection only was not included, for previous experiments had demonstrated that no cardiac lesions develop during the course of infection of this type except, occasionally, those of a purulent character.

DISCUSSION

Various effects of insulin treatment and of hypoglycemia upon the cardiovascular system in man and experimental animals have been described; but in view of the absence of characteristic lesions in the hearts of the uninfected guinea pigs, such a direct effect can be excluded as a cause of the pathological changes observed. Although the cardiac findings were somewhat similar to those in infected, scorbutic guinea pigs, it is probable that the large amounts of cabbage consumed as well as the treatment with ascorbic acid in one group exclude scurvy as a factor in their pathogenesis.

The fact that infected animals treated with thyroxin (*1*) or rendered scorbutic (*9, 10*) develop nonpurulent cardiac lesions suggests that the effect of insulin in rendering the heart susceptible to damage may be associated with enhanced metabolic activity; for the metabolic rate is increased in scurvy (*11*) as well as in hyperthyroidism.

The reason for the failure to induce carditis in rabbits under the conditions of the experiment is not apparent. Overdosage (in view of their high degree of sensitivity to insulin), which resulted in short survival periods, may have been responsible. Furthermore, the rabbits were infected with a group A strain of hemolytic streptococcus while a group C strain was used in the guinea pigs.

CONCLUSIONS

Guinea pigs treated with maximum tolerated doses of protamine insulin and subjected to chronic, hemolytic streptococcus, focal infection develop nonpurulent carditis. This susceptibility to cardiac damage during infection is probably associated with the altered metabolic activity incident to insulin treatment.

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SURVEY OF HEALTH AGENCIES IN THE DISTRICT OF COLUMBIA

In 1937–38, at the request of the Commissioners of the District of Columbia, the United States Public Health Service undertook a comprehensive survey of the health agencies in the District. The report [1] of this survey has just come from the Government Printing Office.

This report presents the findings and recommendations by specific activities, but these are prefaced by a brief, general summary of recommendations and comment. The reports on specific activities include the following: Cancer; communicable disease control; dental hygiene; health education; food inspection (milk and food control); hospitals; laboratories; maternal, infant, and preschool child health services; mental hygiene; mortality trends; public health nursing; pneumonia control; sanitation (sanitary control); school medical inspection; tuberculosis control; and vital statistics. The survey was conducted under the supervision of Asst. Surg. Gen. Robert Olesen, who summarized the recommendations, prepared the introduction, and contributed the section on communicable disease control. The surveys and reports on the other activities are the work of specially qualified investigators chosen to collaborate in the survey. Among these collaborators were Dr. Ethel C. Dunham, of the Children's Bureau, Department of Labor, and Dr. Halbert L. Dunn, of the Vital Statistics Division of the Bureau of the Census.

[1] Report of a Survey of the Health Department and Other Health Agencies in the District of Columbia, made in 1937-38 by the United States Public Health Service and Collaborators. Govt. Printing Office, Washington, D. C. 400 pages. Price 35 cents.

The persons engaged in making the survey made use of the valuable outline contained in the appraisal form for cities, prepared by the committee on administrative practice of the American Public Health Association. While the conclusions, which form the basis of the recommendations, are not founded upon the score attained by this appraisal form, advantage was taken of the opportunity to see how the District of Columbia Health Department appears in the light of present day knowledge and practice.

It is easy to criticize the procedures of any governmental agency; and a health department, because of its numerous and varied activities, is always an especially inviting target. However, the purpose of this survey was not to provide grounds for criticism, but to be fact-finding and helpful in presenting its results and recommendations. The report deals with both the strong and weak points in health work in the District. Despite certain shortcomings, of which the department itself was well aware, it was found that creditable and effective public health work was being performed, and a tribute was paid to the personnel, who have labored "faithfully, intelligently, and usually efficiently," often under discouraging conditions.

While certain conditions in the District of Columbia, especially the peculiarities of the local form of government, are not like those found in any other city of the United States, it is believed that this report should be of unquestionable interest and value to State and municipal health authorities and helpful to all health administrators. A large part of the difficulties with the Health Department of the District of Columbia are shown to spring from lack of funds, a problem complicated by the peculiar form of government in the District. This same question, however, concerns other jurisdictions as well. There is an old apothegm to the effect that "Public health is purchasable; within natural limitations a community can determine its own death rate"; but it is too often true that those who cry out most loudly for better health protection are least willing to bear the increased taxation required to promote an acceptable public health program.

INFLUENZA PREVALENCE

For the week ended March 25, 1939, the incidence of influenza, as reported to the United States Public Health Service by the State health authorities, again registered a decrease from the figures for the preceding week, the second such decrease since the week ended March 11, which, at this time, appears to have recorded the peak incidence of the present mild epidemic. The South Atlantic and the four groups of Central States apparently still show the greatest relative incidence, with the Mountain States next.

Cases of influenza reported by weeks, Jan. 1–Mar. 25, 1939

Division and State	Week ended—											
	Jan. 7	Jan. 14	Jan. 21	Jan. 28	Feb. 4	Feb. 11	Feb. 18	Feb. 25	Mar. 4	Mar. 11	Mar. 18	Mar. 25
NEW ENGLAND												
Maine	1	3	2	10	4	1	8	25	46	108	30	54
New Hampshire				1							40	
Vermont												
Massachusetts												
Rhode Island										1		
Connecticut	10	6	13	4	7	26	22	29	30	141	20	133
MIDDLE ATLANTIC												
New York	44	57	37	155	159	183	137	101	91	57	38	60
New Jersey	14	24	12	19	56	61	99	44	24	19	13	12
Pennsylvania												
EAST NORTH CENTRAL												
Ohio												
Indiana	12	11	22	4	21	21	363	1,085	607	35	210	155
Illinois	18	12	60	30	36	227	955	1,478	1,241	838	541	326
Michigan			1	2		1	39	255	429	674	220	208
Wisconsin	62	65	52	47	68	65	56	346	584	1,516	1,484	969
WEST NORTH CENTRAL												
Minnesota		2	3	2		1	3	24	12	40	22	34
Iowa		4	10	2	1	8	27	291	1,083	695	643	299
Missouri	70	59	24	33	24	42	137		644	678	452	209
North Dakota	34	11	12	6	27	15	14	64	364	741	254	414
South Dakota	6			2	1	10	3	6	77	50	22	40
Nebraska				1					2	1	22	7
Kansas	16	9	9	6	6	3	9	77	116	226	205	70
SOUTH ATLANTIC												
Delaware												1
Maryland	4	5	12	10	61	103	182	209	124	53	79	19
District of Columbia	2	2	6		5	5	18	25	25	11	3	3
Virginia	454	420	282	617	1,100	553	1,338	1,604	1,509	1,991	2,443	1,766
West Virginia	21	13	34	41	21	26	83	36	271	71	218	118
North Carolina	3	7	28	9	9	18	71	230	97	386	172	105
South Carolina	909	495	865	649	772	701	972	592	1,181	1,142	872	1,636
Georgia	133	136	143	110	131	118	139	110	140	420	286	565
Florida	1	1	2	5		1	1		9	3	5	19
EAST SOUTH CENTRAL												
Kentucky	56	65	37	27	198	54	478	405	1,348	1,792	560	412
Tennessee	36	64	87	109	58	75	63	83	146	469	420	516
Alabama	158	191	188	169	259	186	160	180	599	1,126	1,862	2,154
Mississippi												
WEST SOUTH CENTRAL												
Arkansas	181	203	145	189	159	87	113	182	1,473	1,532	577	1,031
Louisiana	7	36	12	8	10	20	11	9	30	82	27	64
Oklahoma	222	149	119	193	162	207	129	193	334	387	682	466
Texas	492	716	531	703	699	621	983	737	965	968	1,718	1,773
MOUNTAIN												
Montana	5	26	33	50	25	42	35	200	126	125	145	406
Idaho	4	2	1	1	1			12	1	14	4	
Wyoming									1	8		2
Colorado	21	21	31	45	35	93	125	121	150	136	73	74
New Mexico	2	1	21	10	6	9	1	3	57	677	670	198
Arizona	138	117	132	81	68	114	82	94	144	191	476	307
Utah	7	1	2	9	20	24	16	44	53	119	86	71
PACIFIC												
Washington		4	1			1	3		8	3		20
Oregon	71	39	46	53	25	40	42	34	97	261	118	63
California	41	41	82	33	76	43	28	59	50	73	209	239
Total	3,255	3,018	3,097	3,395	4,310	3,802	6,895	8,987	14,288	18,135	15,921	14,953

The plotted graph of cases not only indicates an unusually late seasonal peak, but the decline from that peak appears to be slow, as the early section of the descending slope presents a low gradient. It is also interesting to note that, so far at least, there has been no indication that this influenza epidemic has been accompanied by an excess of pneumonia deaths in a group of 90 cities scattered throughout the United States. The weekly numbers of pneumonia deaths in these cities have, so far, remained below the expectancy based on a 5-year average, although influenza cases reported by these same cities have been above the expectancy since the week ended February 18, and the deaths above the expectancy since the week ended February 25.

The accompanying tables present the numbers of cases of influenza reported weekly by States from the first of the year to and including the week ended March 25, and influenza and pneumonia data for a large group of cities, with an aggregate population of approximately 33,000,000, to and including the week ended March 18.

Reports from a group of 90 cities in the United States, with an aggregate population of approximately 33,000,000

	Week ended—										
	Jan. 7, 1939	Jan. 14, 1939	Jan. 21, 1939	Jan. 28, 1939	Feb. 4, 1939	Feb. 11, 1939	Feb. 18, 1939	Feb. 25, 1939	Mar. 4, 1939	Mar. 11, 1939	Mar. 18, 1939
Influenza:											
Cases, current year	208	260	312	311	411	688	1,413	1,339	1,285	1,124	1,165
5-year median	899	1,145	1,320	1,299	1,270	1,122	989	839	736	629	530
Deaths, current year	74	61	71	57	71	73	104	159	200	181	161
5-year median	132	150	160	159	157	150	144	139	128	119	112
Pneumonia:											
Deaths, current year	811	771	702	726	758	813	871	943	917	907	818
5-year median	1,010	1,040	1,056	1,019	992	983	993	994	989	972	949

DEATHS DURING WEEK ENDED MAR. 11, 1939

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

	Week ended Mar. 11, 1939	Corresponding week, 1938
Data from 88 large cities of the United States:		
Total deaths	9,685	[1] 9,055
Average for 3 prior years	[1] 9,564	
Total deaths, first 10 weeks of year	95,246	90,000
Deaths under 1 year of age	554	[1] 559
Average for 3 prior years	[1] 592	
Deaths under 1 year of age, first 10 weeks of year	5,557	5,448
Data from industrial insurance companies:		
Policies in force	67,823,716	69,759,312
Number of death claims	17,982	13,837
Death claims per 1,000 policies in force, annual rate	13.8	10.3
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10.6	10.1

[1] Data for 86 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.

In these and the following tables, a zero (0) indicates a positive report and has the same significance as any other figure, while leaders (----) represent no report, with the implication that cases or deaths may have occurred but were not reported to the State health officer.

Cases of certain diseases reported by telegraph by State health officers for the week ended Mar. 18, 1939, rates per 100,000 population (annual basis), and comparison with corresponding week of 1938 and 5-year median

Division and State	Diphtheria				Influenza				Measles			
	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median
NEW ENG.												
Maine	0	0	1	1	181	30	4	8	169	28	202	30
New Hampshire	0	0	0	0	406	40	----	----	----	----	18	34
Vermont	0	0	1	0	----	----	----	----	617	46	136	54
Massachusetts	2	2	3	4	----	----	----	----	1,064	905	290	864
Rhode Island	0	0	0	0	----	----	5	----	46	6	9	64
Connecticut	3	1	8	5	59	20	3	15	1,549	522	28	88
MID. ATL.												
New York	11	28	34	35	[1] 26	[1] 38	[1] 10	29	564	1,408	2,293	2,293
New Jersey	6	5	11	14	15	13	25	25	57	48	1,401	1,106
Pennsylvania	28	55	42	42	----	----	----	----	110	216	6,104	3,697
E. NO. CEN.												
Ohio	28	37	20	26	----	----	----	130	21	27	1,777	1,148
Indiana	16	11	38	19	312	210	17	36	21	14	1,062	435
Illinois	29	44	19	35	355	541	14	37	14	22	6,382	1,419
Michigan [2]	12	11	8	10	233	220	1	5	262	248	5,185	86
Wisconsin	4	2	2	2	2,608	1,484	40	67	1,886	1,073	4,959	1,307
W. NO. CEN.												
Minnesota	6	8	2	4	43	22	----	----	1,611	831	62	224
Iowa	10	5	3	6	1,303	643	8	7	348	172	133	183
Missouri	12	9	16	16	581	452	67	172	28	22	1,178	892
North Dakota	7	1	3	2	1,855	254	68	4	570	78	28	28
South Dakota	0	0	0	2	165	22	2	----	1,007	134	----	5
Nebraska	11	3	1	3	84	22	----	4	202	53	46	46
Kansas	8	8	3	9	573	205	22	22	56	20	537	255

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended Mar. 18, 1939, rates per 100,000 population (annual basis), and comparison with corresponding week of 1938 and 5-year median—Continued

Division and State	Diphtheria				Influenza				Measles			
	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1938, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median
SO. ATL.												
Delaware	20	1	3	0	------	------	------	------	------	------	32	48
Maryland [3]	9	8	10	8	244	79	10	34	2,461	798	97	199
Dist. of Col.	65	8	7	7	24	3	4	2	315	39	11	59
Virginia	37	20	24	24	4,579	2,443	------	------	705	376	841	841
West Virginia	19	7	10	13	586	218	56	192	11	4	483	45
North Carolina	19	13	20	15	251	172	24	61	1,879	1,286	3,254	699
South Carolina [3]	16	6	5	5	2,382	872	242	157	33	12	816	46
Georgia [3]	13	8	14	11	475	286	------	225	340	205	483	------
Florida [3]	18	6	11	8	15	5	3	14	359	119	858	100
E. SO. CEN.												
Kentucky	12	7	13	13	973	560	10	78	155	89	982	481
Tennessee	16	9	8	12	741	420	67	226	291	165	998	170
Alabama [3]	11	6	7	9	3,277	1,862	121	308	334	190	1,104	373
Mississippi [3]	20	8	3	4	------	------	------	------	------	------	------	------
W. SO. CEN.												
Arkansas	17	7	6	3	1,431	577	98	106	97	39	272	37
Louisiana	29	12	12	18	65	27	7	18	372	154	5	68
Oklahoma	6	3	6	8	1,372	682	182	198	390	194	126	126
Texas [3]	41	50	35	44	1,424	1,718	511	787	230	277	128	475
MOUNTAIN												
Montana [4]	0	0	3	3	1,357	145	------	25	2,846	304	5	18
Idaho	0	0	0	0	41	4	2	2	724	71	4	13
Wyoming	0	0	1	1	------	------	------	------	1,353	62	29	29
Colorado	53	11	12	5	351	73	------	------	1,218	253	580	214
New Mexico	49	4	9	5	8,279	670	7	21	309	25	70	70
Arizona	61	5	1	1	5,840	476	130	53	233	19	26	55
Utah [3]	20	2	0	0	854	86	------	------	1,043	105	439	23
PACIFIC												
Washington	6	2	4	2	------	------	7	1	1,298	421	9	155
Oregon	20	4	1	0	587	118	72	83	224	45	31	70
California [3]	30	36	30	30	171	209	44	215	3,484	4,248	609	885
Total	18	458	470	536	751	15,921	1,883	3,744	621	15,373	43,622	33,695
11 weeks	21	5,828	6,797	7,002	365	85,103	31,577	76,150	502	136,721	330,311	242,912

Division and State	Meningitis, meningococcus				Poliomyelitis				Scarlet fever			
	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934-38, median
NEW ENG.												
Maine	0	0	0	0	0	0	0	0	103	17	26	25
New Hampshire	0	0	0	0	0	0	0	0	20	2	7	12
Vermont	0	0	0	0	0	0	0	0	80	6	10	18
Massachusetts	2.4	2	1	2	0	0	0	0	199	169	359	287
Rhode Island	0	0	0	0	0	0	0	0	84	11	10	22
Connecticut	3	1	0	0	0	0	0	0	270	91	130	130
MID. ATL.												
New York	0.4	1	3	14	0	0	3	1	269	673	1,017	1,052
New Jersey	1.2	1	1	3	0	0	0	0	190	160	167	206
Pennsylvania	8	6	5	5	0	0	1	0	221	436	514	643

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended Mar. 18, 1939, rates per 100,000 population (annual basis), and comparison with corresponding week of 1938 and 5-year median—Continued

Division and State	Meningitis, meningococcus				Poliomyelitis				Scarlet fever			
	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934–38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934–38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934–38, median
E. NO. CEN.												
Ohio	2.3	8	1	11	0.8	1	1	1	429	558	317	445
Indiana	8	2	4	2	1.5	1	0	0	308	207	166	229
Illinois	0	0	2	8	0	0	1	1	292	446	601	874
Michigan [3]	0	0	0	1	0	0	0	0	467	442	596	596
Wisconsin	1.8	1	1	2	1.8	1	0	0	327	186	172	407
W. NO. CEN.												
Minnesota	0	0	0	0	0	0	0	0	204	105	135	160
Iowa	0	0	2	1	0	0	0	0	318	157	285	233
Missouri	0	0	1	2	1.3	1	0	0	99	77	250	216
North Dakota	0	0	2	0	0	0	0	0	204	28	29	41
South Dakota	0	0	0	0	0	0	0	0	90	12	16	16
Nebraska	4	1	1	1	0	0	0	0	115	30	25	57
Kansas	0	0	0	2	0	0	0	0	363	130	189	189
SO. ATL.												
Delaware	0	0	0	0	0	0	0	0	98	5	27	19
Maryland [3]	6	2	0	4	0	0	0	0	145	47	109	87
District of Columbia	0	0	0	2	0	0	0	0	162	20	18	18
Virginia	4	2	3	7	0	0	3	1	62	33	50	50
West Virginia	5	2	1	7	0	0	0	0	156	58	68	68
North Carolina	1.5	1	1	1	0	0	0	1	69	47	41	41
South Carolina [3]	0	0	0	1	0	0	0	0	11	4	1	4
Georgia [3]	0	0	3	2	0	0	0	0	8	5	11	11
Florida [3]	0	0	8	8	3	1	0	0	30	10	6	9
E. SO. CEN.												
Kentucky	3	2	6	6	0	0	0	0	118	68	100	50
Tennessee	9	5	5	5	0	0	1	0	104	59	55	33
Alabama [3]	12	7	13	2	0	0	1	1	25	14	15	13
Mississippi [3]	2.5	1	0	1	2.5	1	1	0	13	5	3	6
W. SO. CEN.												
Arkansas	0	0	2	0	0	0	1	0	27	11	10	10
Louisiana	2.4	1	0	0	0	0	0	0	17	7	11	14
Oklahoma	0	0	1	5	0	0	1	0	125	62	27	18
Texas [3]	3	4	1	6	0.8	1	0	1	59	71	96	96
MOUNTAIN												
Montana [4]	0	0	0	0	0	0	0	0	262	28	21	21
Idaho	10	1	0	0	0	0	0	0	214	21	22	22
Wyoming	0	0	0	0	0	0	0	0	196	9	10	10
Colorado	0	0	0	0	0	0	1	0	246	51	57	67
New Mexico	5	1	0	1	0	0	0	0	371	30	33	22
Arizona	61	5	0	0	12	1	0	0	86	7	5	20
Utah [3]	0	0	0	0	0	0	0	0	288	29	47	47
PACIFIC												
Washington	3	1	0	0	0	0	1	1	142	46	47	52
Oregon	0	0	0	1	0	0	0	0	244	49	55	39
California [3]	0.8	1	3	4	0.8	1	6	6	238	290	239	239
Total	2.1	54	66	159	0.4	9	22	21	200	5,029	6,205	7,900
11 weeks	2.1	587	1,009	1,320	0.6	170	238	228	213	58,995	67,405	73,363

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended Mar. 18, 1939, rates per 100,000 population (annual basis) and comparison with corresponding week of 1938 and 5-year median—Continued

Division and State	Smallpox				Typhoid and paratyphoid fever				Whooping cough		
	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934–38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases	1934–38, median	Mar. 18, 1939, rate	Mar. 18, 1939, cases	Mar. 19, 1938, cases
NEW ENG.											
Maine	0	0	0	0	0	0	2	1	199	33	69
New Hampshire	0	0	0	0	0	0	0	0	10	1	0
Vermont	0	0	0	0	0	0	0	0	911	68	42
Massachusetts	0	0	0	0	2	2	0	1	189	161	145
Rhode Island	0	0	0	0	0	0	0	0	214	28	22
Connecticut	0	0	0	0	8	1	0	0	344	116	61
MID. ATL.											
New York	0	0	0	0	2	6	8	7	224	560	404
New Jersey	0	0	0	0	5	4	1	1	488	410	163
Pennsylvania	0	0	0	0	4	8	6	6	183	361	223
E. NO. CEN.											
Ohio	16	21	13	0	2	2	1	2	153	199	82
Indiana	62	42	48	4	1	1	2	0	58	39	38
Illinois	7	10	35	13	3	4	3	8	174	265	94
Michigan [2]	18	17	19	2	1	1	8	4	156	148	228
Wisconsin	9	5	4	15	2	1	1	1	408	232	140
W. NO. CEN.											
Minnesota	21	11	20	9	2	1	1	0	79	41	27
Iowa	47	23	36	11	2	1	1	1	14	7	23
Missouri	10	8	54	15	3	2	2	1	51	40	57
North Dakota	22	3	13	4	0	0	0	0	29	4	29
South Dakota	30	4	6	4	0	0	0	0	0	0	19
Nebraska	57	15	8	11	0	0	0	0	0	0	6
Kansas	14	5	14	14	0	0	1	1	48	17	136
SO. ATL.											
Delaware	0	0	0	0	0	0	1	0	79	4	10
Maryland [2]	0	0	0	0	3	1	0	1	102	33	70
Dist. of Col	0	0	0	0	0	0	0	0	162	20	11
Virginia	0	0	0	0	15	8	2	3	229	122	80
West Virginia	0	0	0	0	8	3	2	2	116	43	53
North Carolina	1	1	1	0	0	0	2	2	506	346	473
South Carolina [3]	0	0	0	0	0	0	1	1	208	76	56
Georgia [3]	0	0	6	0	5	3	6	2	85	51	104
Florida [3]	0	0	1	0	9	3	2	3	84	28	7
E. SO. CEN.											
Kentucky	12	7	19	0	7	4	2	3	33	19	37
Tennessee	0	0	4	0	4	2	2	2	62	35	53
Alabama [3]	0	0	0	0	4	2	4	1	53	30	31
Mississippi [2]	0	0	3	0	5	2	1	2	------	------	------
W. SO. CEN.											
Arkansas	2	1	5	2	10	4	7	1	45	18	23
Louisiana	5	2	8	4	41	17	33	9	5	2	20
Oklahoma	111	55	14	8	0	0	0	2	2	1	64
Texas [3]	22	27	23	7	12	14	15	12	94	114	312
MOUNTAIN											
Montana [4]	19	2	9	9	0	0	0	1	47	5	60
Idaho	31	3	17	3	10	1	0	0	31	3	28
Wyoming	0	0	0	0	0	0	0	0	109	5	3
Colorado	0	0	8	6	0	0	1	1	342	71	13
New Mexico	25	2	0	0	0	0	2	2	148	12	51
Arizona	0	0	14	1	12	1	2	0	307	25	20
Utah [2]	0	0	1	1	0	0	0	0	358	36	38
PACIFIC											
Washington	19	6	43	25	0	0	2	2	83	27	188
Oregon	89	18	29	10	5	1	2	2	65	13	28
California [3]	82	39	44	17	1	1	8	5	127	155	523
Total	13	327	514	283	4	101	129	112	163	4,024	4,364
11 weeks	15	4,250	6,198	2,336	5	1,296	1,302	1,302	171	46,440	44,995

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 18, 1939, 13 cases as follows: South Carolina, 1; Georgia, 3; Florida, 2; Alabama, 4; Texas, 2; California, 1.
[4] Rocky Mountain spotted fever, Montana, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningitis, meningococcus	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid and paratyphoid fever
February 1939										
Alabama	14	39	785	56	917	11	6	83	6	16
Arizona	4	29	412	1	102	5	1	41	70	1
California	6	183	259	1	11,264	2	4	965	84	15
Colorado	4	48	452		293		1	153	52	0
Florida	0	30	6	11	346	7	2	58	1	7
Georgia	5	37	519	40	667	55	2	81	1	11
Iowa	1	29	549		687		0	595	180	8
Kentucky	16	84	1,132	1	319	2	5	347	25	15
Maine	0	19	35		73		0	120	0	4
Minnesota	0	26	45		5,106		2	554	49	0
Missouri	6	84	599		34	1	2	483	35	8
New Jersey	8	37	246		89			693	0	4
New Mexico	8	4	58		142	2	8	65	8	7
West Virginia	8	82	866		106		4	219	2	16

February 1939

	Cases
Anthrax:	
New Jersey	1
Beriberi:	
California	1
Botulism:	
California	2
Chickenpox:	
Alabama	206
Arizona	96
California	3,313
Colorado	339
Florida	173
Georgia	314
Iowa	446
Kentucky	544
Maine	265
Minnesota	250
Missouri	255
New Jersey	1,249
New Mexico	116
West Virginia	151
Conjunctivitis, infectious:	
Georgia	4
New Mexico	1
Dysentery:	
Arizona	81
California (amoebic)	28
California (bacillary)	22
Colorado (bacillary)	1
Florida (amoebic)	2
Florida (bacillary)	2
Georgia (amoebic)	8
Georgia (bacillary)	5
Iowa (amoebic)	1
Iowa (bacillary)	1
Kentucky (amoebic)	1
Minnesota (amoebic)	2
Minnesota (bacillary)	1
Missouri	2
New Mexico (bacillary)	1
West Virginia (bacillary)	1
Encephalitis, epidemic or lethargic:	
Alabama	1
California	1
Colorado	2
Iowa	2
Missouri	3
New Jersey	1
Food poisoning:	
California	97
German measles:	
Alabama	17
Arizona	5

	Cases
German measles—Con.	
California	139
Florida	3
Maine	8
New Jersey	42
New Mexico	4
Granuloma, coccidioidal:	
California	3
Hookworm disease:	
California	1
Florida	651
Georgia	1,667
Jaundice, epidemic:	
California	1
Minnesota	2
Leprosy:	
California	1
Mumps:	
Alabama	128
Arizona	63
California	3,672
Colorado	28
Florida	54
Georgia	190
Iowa	234
Kentucky	183
Maine	23
Missouri	470
New Jersey	452
New Mexico	20
West Virginia	107
Ophthalmia neonatorum:	
Alabama	2
California	1
New Jersey	19
Puerperal septicemia:	
New Mexico	3
Rabies in animals:	
Alabama	21
California	113
Florida	1
Minnesota	4
New Jersey	92
New Mexico	9
Septic sore throat:	
California	24
Colorado	8
Florida	9
Georgia	42
Iowa	6
Kentucky	173
Minnesota	12
Missouri	28
New Jersey	54
New Mexico	6
West Virginia	1

	Cases
Tetanus:	
Alabama	3
California	3
Florida	1
Georgia	1
Maine	1
New Jersey	1
Trachoma:	
Arizona	52
California	29
Minnesota	1
Missouri	56
Trichinosis:	
California	3
Tularaemia:	
Alabama	3
Georgia	14
Iowa	2
Kentucky	10
Missouri	4
Typhus fever:	
Alabama	12
California	1
Florida	7
Georgia	42
Undulant fever:	
Alabama	3
Arizona	2
California	25
Florida	3
Georgia	14
Iowa	6
Kentucky	1
Maine	3
Minnesota	2
Missouri	1
New Mexico	1
West Virginia	1
Vincent's infection:	
Florida	19
Maine	6
Whooping cough:	
Alabama	99
Arkansas	78
California	470
Colorado	198
Florida	123
Georgia	126
Iowa	86
Kentucky	83
Maine	144
Minnesota	185
Missouri	106
New Jersey	1,758
New Mexico	86
West Virginia	110

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 11, 1939

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

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								
Data for 90 cities:											
5-year average	181	629	119	8,331	972	2,518	25	404	19	1,350	--------
Current week	139	1,124	181	4,400	907	1,557	28	371	55	1,330	--------
Maine:											
Portland	1	------	0	3	0	1	0	0	0	19	12
New Hampshire:											
Concord	0	------	0	0	3	2	0	0	0	0	15
Manchester	0	------	1	0	2	0	0	0	0	0	18
Nashua	0	------	0	0	1	0	0	0	0	0	9
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	17	1
Burlington	0	------	0	1	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	2	------	1	139	31	83	0	6	1	23	235
Fall River	0	------	1	1	3	1	0	1	0	0	34
Springfield	0	------	0	25	3	2	0	1	0	2	35
Worcester	0	------	1	3	14	19	0	0	0	38	58
Rhode Island:											
Pawtucket	0	------	0	0	1	0	0	1	0	2	28
Providence	0	1	1	6	6	4	0	2	0	28	62
Connecticut:											
Bridgeport	0	1	1	1	2	4	0	0	0	1	31
Hartford	0	3	0	218	2	8	0	0	0	25	43
New Haven	0	3	1	118	6	5	0	1	0	6	52
New York:											
Buffalo	0	1	2	148	16	71	0	6	0	43	149
New York	35	57	8	73	120	228	0	91	5	165	1,591
Rochester	0	3	0	104	4	29	0	0	0	13	67
Syracuse	0	------	0	101	4	32	0	0	0	25	42
New Jersey:											
Camden	0	1	1	0	1	13	0	0	0	1	34
Newark	0	1	0	6	11	47	0	8	0	74	96
Trenton	0	------	2	0	11	4	0	1	0	8	58
Pennsylvania:											
Philadelphia	0	16	6	42	32	51	0	22	3	95	557
Pittsburgh	5	26	17	3	33	28	0	7	0	29	224
Reading	5	------	2	1	6	0	0	0	0	3	47
Scranton	0	------	--------	2	-------	17	0	-------	0	4	--------
Ohio:											
Cincinnati	7	22	15	1	28	26	0	7	0	0	201
Cleveland	4	180	9	5	43	69	0	8	0	45	229
Columbus	2	2	2	0	16	8	0	2	0	6	143
Toledo	0	8	7	0	5	21	0	3	0	12	82
Indiana:											
Anderson	0	------	1	0	1	0	7	1	0	0	15
Fort Wayne	0	------	1	0	5	7	0	0	0	0	42
Indianapolis	3	------	8	2	30	51	17	3	0	20	152
Muncie	0	------	3	11	4	3	1	1	0	0	15
South Bend	0	------	2	0	2	1	0	0	0	14	30
Terre Haute	0	------	2	0	9	3	0	0	0	0	27
Illinois:											
Alton	0	------	0	0	2	3	0	0	0	0	9
Chicago	13	39	17	6	70	190	0	40	0	137	840
Elgin	0	1	1	0	1	12	0	0	0	2	12
Moline	0	14	0	0	3	3	0	0	0	0	14
Springfield	0	------	8	0	11	3	0	0	0	0	40
Michigan:											
Detroit	3	19	12	13	34	107	0	11	0	70	306
Flint	0	------	3	117	12	20	0	8	0	0	38
Grand Rapids	0	180	4	0	8	26	0	0	0	2	66
Wisconsin:											
Kenosha	0	------	0	2	0	2	0	0	0	20	5
Madison	0	------	1	0	2	5	0	0	0	9	11
Milwaukee	0	41	6	1	11	50	0	7	0	85	138
Racine	0	------	0	4	0	6	0	0	0	3	18
Superior	0	------	0	3	0	0	0	0	0	0	7

City reports for week ended Mar. 11, 1939—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	27	1	2	0	4	0	1	0	10	18
Minneapolis	1	------	1	219	11	27	2	1	0	88	137
St. Paul	0	2	2	220	18	20	0	8	0	3	92
Iowa:											
Cedar Rapids	0	------	------	1	------	0	0	------	0	2	------
Davenport	1	------	------	0	------	5	1	------	0	1	------
Des Moines	0	------	0	1	0	23	2	0	0	0	50
Sioux City	0	------	------	17	------	1	0	------	0	2	------
Waterloo	1	------	------	0	------	21	0	------	0	0	------
Missouri:											
Kansas City	0	1	5	1	14	17	0	5	0	0	120
St. Joseph	0	------	0	0	5	0	0	1	0	0	23
St. Louis	6	16	1	2	16	24	0	5	0	19	224
North Dakota:											
Fargo	0	------	1	0	3	2	0	0	0	0	18
Grand Forks	0	------	------	0	------	0	0	------	2	1	------
Minot	0	100	0	13	0	0	0	0	0	0	11
South Dakota:											
Aberdeen	0	------	------	0	------	0	3	------	0	0	------
Sioux Falls	0	------	0	11	0	7	2	0	0	0	8
Nebraska:											
Lincoln	1	------	------	12	------	1	0	------	0	2	------
Omaha	0	------	3	2	10	5	2	1	0	1	78
Kansas:											
Lawrence	0	54	0	0	1	0	0	0	0	0	11
Topeka	0	------	0	1	4	4	0	0	0	0	18
Wichita	0	7	0	6	7	6	0	1	0	0	42
Delaware:											
Wilmington	1	------	0	1	8	3	0	0	0	0	34
Maryland:											
Baltimore	2	20	5	889	15	18	0	17	0	9	213
Cumberland	0	5	0	0	3	1	0	0	0	0	18
Frederick	0	------	0	0	0	0	0	0	0	0	5
Dist. of Columbia:											
Washington	1	11	8	0	11	15	0	10	2	36	168
Virginia:											
Lynchburg	1	------	0	123	1	0	0	0	0	3	15
Norfolk	0	54	0	45	4	4	0	0	0	2	25
Richmond	1	------	2	41	8	2	0	8	0	0	56
Roanoke	0	------	0	2	3	2	0	0	0	0	18
West Virginia:											
Charleston	0	2	0	0	4	0	0	2	0	0	30
Huntington	1	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	0	4	0	0	0	0	17	20
North Carolina:											
Gastonia	0	1	------	0	------	0	0	------	0	1	------
Raleigh	0	------	0	0	4	2	0	0	0	1	23
Wilmington	1	------	0	1	1	1	0	1	2	10	12
Winston-Salem	0	------	0	205	1	0	0	0	0	1	16
South Carolina:											
Charleston	0	15	1	0	3	4	0	1	1	1	21
Florence	0	------	0	1	2	0	0	0	0	0	6
Greenville	0	------	0	0	1	0	0	1	0	1	13
Georgia:											
Atlanta	0	25	2	0	10	8	0	0	1	2	90
Brunswick	0	------	0	13	0	2	0	0	0	0	3
Savannah	0	65	0	1	5	3	0	2	0	17	23
Florida:											
Miami	0	------	0	4	3	3	0	0	0	19	44
Tampa	2	------	0	88	0	1	0	1	0	1	20
Kentucky:											
Ashland	0	6	0	0	2	0	0	1	0	0	9
Covington	1	2	2	1	8	6	0	0	0	0	26
Lexington	0	------	0	4	5	2	0	0	0	1	20
Louisville	0	567	1	1	14	14	0	3	0	7	96
Tennessee:											
Knoxville	0	17	1	0	7	4	0	1	0	4	33
Memphis	0	------	2	1	4	13	0	4	0	18	75
Nashville	0	------	2	2	7	11	0	3	0	4	55
Alabama:											
Birmingham	0	177	7	3	11	3	0	9	1	0	100
Mobile	0	2	0	0	3	2	0	0	0	0	21
Montgomery	0	10	------	9	------	1	0	------	0	1	------

City reports for week ended Mar. 11, 1939—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								
Arkansas:											
Fort Smith	0	4	------	10	------	1	0	------	0	1	------
Little Rock	0	------	1	0	5	0	0	3	0	0	10
Louisiana:											
Lake Charles	1	------	0	81	1	1	0	0	2	0	9
New Orleans	10	60	9	53	27	6	1	13	35	16	210
Shreveport	1	------	0	2	5	0	0	0	1	0	50
Oklahoma:											
Oklahoma City	0	20	2	3	8	8	0	2	0	0	56
Tulsa	0	------	------	3	------	4	2	------	0	0	------
Texas:											
Dallas	3	12	1	5	7	4	2	0	0	1	74
Fort Worth	0	78	2	5	15	2	1	1	0	1	51
Galveston	0	------	0	0	1	1	0	2	0	0	13
Houston	6	1	1	59	16	4	0	2	3	4	105
San Antonio	1	8	1	0	9	2	0	6	0	3	73
Montana:											
Billings	0	------	0	4	2	6	0	0	0	0	10
Great Falls	0	32	1	7	0	0	0	0	0	0	12
Helena	0	------	0	86	0	0	0	0	0	0	6
Missoula	0	2	0	40	1	0	0	0	0	0	2
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	3
Colorado:											
Colorado Springs	0	------	0	101	3	4	0	0	0	13	18
Denver	9	------	0	18	5	6	0	2	0	34	70
Pueblo	0	------	1	32	8	1	0	1	0	3	13
New Mexico:											
Albuquerque	1	4	2	2	4	1	0	2	0	0	14
Utah:											
Salt Lake City	0	------	1	5	2	11	0	2	0	7	29
Washington:											
Seattle	1	------	2	73	2	14	0	4	0	13	87
Spokane	0	1	1	137	3	1	0	0	0	2	31
Tacoma	0	------	0	0	3	1	0	0	0	0	37
Oregon:											
Portland	1	4	0	0	10	8	11	8	0	0	83
Salem	0	1	------	1	------	1	0	------	0	0	------
California:											
Los Angeles	10	32	0	407	20	80	1	24	0	27	326
Sacramento	0	7	0	226	8	2	3	3	0	0	34
San Francisco	2	3	1	277	7	17	0	11	0	12	160

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Springfield	0	1	0
New York:			
Buffalo	2	0	0
New York	5	0	0
Ohio:			
Cleveland	1	0	0
Toledo	1	0	0
Illinois:			
Chicago	4	0	0
Iowa:			
Des Moines	1	0	0
District of Columbia:			
Washington	1	0	0

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
West Virginia:			
Wheeling	0	1	0
South Carolina:			
Charleston	0	0	1
Kentucky:			
Lexington	0	0	1
Tennessee:			
Nashville	1	0	0
Louisiana:			
New Orleans	1	0	0
Texas:			
Houston	1	0	0
California:			
Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Springfield, Mass., 1; Los Angeles, 1.
Pellagra.—Cases: Atlanta, 1; Brunswick, 1; Savannah, 3; Los Angeles, 1; San Francisco, 1.
Typhus fever.—Cases: Wilmington, N. C., 1; Atlanta, 1; Mobile, 1; Los Angeles, 2.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Weeks ended February 18 and 25, 1939.—During the weeks ended February 18 and 25, 1939, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Week ended Feb. 18, 1939

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2	2					4
Chickenpox			5	98	354	29	18	19	121	644
Diphtheria			2	38	2		3			45
Influenza	1	18	16		103	10			12	160
Measles		3	7	224	1, 161	30	2	16	4	1, 447
Mumps				49	59		2	2	1	113
Pneumonia		2			32		1		12	47
Poliomyelitis				1				4		5
Scarlet fever		6	21	69	215	20	38	51	15	435
Smallpox						1		36		37
Trachoma									1	1
Tuberculosis	2		13	75	42	12		1	20	165
Typhoid and paratyphoid fever				3	3	1			2	9
Whooping cough				148	262	22	2		34	468

Week ended Feb. 25, 1939

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		2		1	1					4
Chickenpox			3	193	308	25	62	8	109	678
Diphtheria	1	3	8	33	2	8	6	1		52
Influenza		86	2		177	52			86	403
Measles			8	160	999	11	1	8		1, 187
Mumps				59	73	50		6	2	190
Pneumonia		2			39		1		7	49
Scarlet fever		1	24	91	187	38	25	42	18	426
Smallpox					1			1		2
Trachoma							25		1	26
Tuberculosis	8	11	9	65	43	2		1	4	138
Typhoid and paratyphoid fever			1	7		1				9
Whooping cough			7	124	278	9	2	1	88	509

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended December 31, 1938.—During the 13 weeks ended December 31, 1938, cases of certain infectious diseases were reported in England and Wales, as follows:

Disease	Cases	Disease	Cases
Diphtheria	17,681	Puerperal pyrexia	2,148
Dysentery	549	Scarlet fever	24,206
Ophthalmia neonatorum	1,131	Smallpox	3
Pneumonia	9,248	Typhoid fever	858

England and Wales—Vital statistics—Fourth quarter 1938.—During the fourth quarter ended December 31, 1938, 143,849 live births and 119,222 deaths were registered in England and Wales. The following statistics are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General of England and Wales, and are provisional:

Birth and death rates in England and Wales, quarter ended Dec. 31, 1938

Annual rates per 1,000 population:	
Live births	13.80
Stillbirths	.56
Deaths, all causes	11.50
Deaths under 1 year of age	[1] 52
Deaths from—	
Diarrhea and enteritis (under 2 years of age)	[1] 5.50
Annual rates per 1,000 population—Continued:	
Deaths from—Continued	
Diphtheria	.06
Influenza	.08
Measles	0
Scarlet fever	.01
Typhoid and paratyphoid fever	0
Whooping cough	.02

[1] Per 1,000 live births.

MEXICO

Smallpox.—According to information furnished by the American Consulate at Monterrey, Mexico, there was an outbreak of smallpox during the week ended March 11, 1939, in the region of General Teran, Galeana, and Linares, in the State of Nuevo Leon, south of Monterrey, with 28 cases reported. The Mexican Federal Public Health Service required for a time that all tourists passing on the Pan-American Highway through Lenares be vaccinated, but subsequently the order was changed to exempt those having an acceptable recent vaccination certificate.

Information dated March 24, 1939, reports the presence of an outbreak of smallpox in Tampico, State of Tamaulipas, with 35 cases to date this year.

For more than a year the border State of Texas has been reporting considerable numbers of cases of smallpox.

NIGERIA

Warri—Yellow fever.—Under date of March 29, 1939, one case of yellow fever was reported in Warri, Nigeria, West Africa. It was stated that, on March 27, the port and township of Warri were declared to be an infected area.

SMALLPOX ON VESSEL

British motorship "Rugelsey"—Williamshead, B. C., from Shanghai.—The British motorship *Rugelsey* arrived at Williamshead, British Columbia, on February 19, 1939, from Shanghai, China (January 30), with a history of 10 cases of smallpox on board. The first case was recognized on February 3, four days out of Shanghai, and the last on February 27. The death occurred on March 3, at the isolation hospital at Williamshead, where the crew had been taken on February 20. The ship was not scheduled for United States ports but came into Port Wells, Washington, north of Seattle, for refueling, on March 17. Free pratique was issued, but no communication was allowed between the vessel and the dock.

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 table 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		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938 3	10	17	24	31	January 1939 7	14	21	28	February 1939 4	11	18	25
Afghanistan: [1] Kabul	C				18													
China:																		
Amoy	C				7													
	D				3													
Canton	C	13	19	12														
	D	2	4															
Foochow	C		95	40	77	77		31	10		6							
	D		41	21	5	5		1	1		2							
Hankow	C	162	73	2														
Hong Kong	C	128	68	46	29	2	3	1		5	2	2	1					
	D	54	42	21	20	3	2	1		3			2					
Kwantung Province	C	2,581	2,870	142														
	D	696	752	26														
Macao	C	182	113	112	43	1												
	D	127	41		10	1												
Mukden	C	P																
Shanghai	C	3,876	988	401	32		6		4									
Swatow	C	27	37	12	7			1										
Tientsin	C	28	5															
Tsingtao	C	P																
Yunnanfu [2]	C																	
Chosen (Korea)	C		47	2														
	D		27	1														
India	C	55,794	45,668	34,396	11,391	2,352	1,350	622	895	785	612	594						
	D	25,767	20,788	17,568	6,516	1,972	835	301	473	397	270	354						
Allahabad	C	5			2													
Assam	C	236	1,093	2,253	3,555	1,046	629	419	421	348	194	157	62	14	51	13	32	
	D	101	555	921	1,980	720	452	214	236	216	121	121	44	9	32	12	14	
Bengal Presidency	C	728	4,598	9,443	12,553	3,741	3,066	3,062	2,252	2,114		1,970	1,476	1,031	917	832	689	
	D	362	2,288	5,048	7,175	2,177	1,778	1,721	1,203	1,194		987	804	516	492	431	353	
Bombay Presidency	C	2,123	1,478	1,496	1,037	227	66	96	76	48	61	33	82	82				
	D	749	684	663	452	59	23	44	38	17	19	21	34	37				

[1] Cholera also reported present early in June in South Afghanistan.
[2] Information dated Nov. 30, 1938, stated that cholera had appeared in villages near Yunnanfu, China. In one village of approximately 1,000 persons, 500 were said to have died.

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

CHOLERA—Continued

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

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938 3	10	17	24	31	January 1939 7	14	21	28	February 1939 4	11	18	25
India—Continued.																		
Bombay	C	8																
Calcutta	C	70	89	114	136	34	38	20	15	7	14	11	18	16	4	29	34	51
Cawnpore	C	101	26	4														
	D	34	8	1														
Central Provinces and Berar	C	27,998	24,285	8,028	1,135	102	57	28	5	36	33	48		14	8	18	1	34
Chittagong	C	3					1											
Delhi	C	1																
Howrah	C	103	137	126	32	37	23	35	50	23	12							
Madras Presidency	C	1,898	1,842	1,663	253	63	64	70	130	241	251	227	491					
	D	850	731	733	115	27	31	26	49	78	75	117	203					
Madras	C	2	2	4	4	1		1		1							1	2
	D			2	2					1								
Negapatam	C				5	1	4		1	1	2							
	D				1		2											
Northwest Frontier Province	C	468	114	26	6													
Orissa Province	C	52	12	33	2		15		1	4	13		11	12	7	22	14	30
Punjab	C	88	15															
Rangoon	C		1	1														
Sind State	C	61	1															
Tirumalaivasal	C														3		2	
India (French):																		
Chandernagor Territory	C		1		1								2					
Karikal Territory	C			1				1			1		1	3				
Pondichery Province	C			3														
India (Portuguese): Damao	C		7															
Indochina (French):																		
Annam Province	C	440	85	7														
Tonkin Province	C	23	7	77														
Hanoi	C	4																
Japan:																		
Fukuoka Prefecture—Wakamatsu	C			3														
Hiroshima Prefecture—Fukuyama	C			3														

On vessels:
- S. S. *Kweiyang* at Bangkok from Swatow and Hong Kong. 1 case. Aug. 5, 1938
- S. S. *Ethiopia* at Madras. 1 case. Sept. 5, 1938

PLAGUE [1]

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938: 3	10	17	24	31	January 1939: 7	14	21	28	February 1939: 4	11	18	25
Algeria: Algiers.[2]																		
Argentina. (See table below.)																		
Belgian Congo	C	3	1			1												
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	4	2	1		1												
Uganda	C	45	53	63	27	4	3	1	1		3	1	1	9	11	5		
	D	44	50	62	28	4	3	1	1		3	1	1	9	11	5		
Ceylon:																		
Colombo	C	1																
	D	1																
Plague-infected rats		2																
China: [3]																		
Dutch East Indies: Java and Madura	C	120	120	150	98	14												
	D	120	120	145	97	14												
Ecuador:																		
Guayaquil	C				2													
	D				2													
Plague-infected rats					3										1			
Loja	C														[4] 4			
Pueblo Viejo	C																3	
Riobamba	C																[5] 16	
	D																15	
Egypt: Asyut Province	C													1	1	4	1	26
Hawaii Territory: Plague-infected rats:																		
Hawaii Island—Hamakua District—																		
Hamakua Mill Sector				6	13		[6] 23		10	7								
Kaiwiki										1								
Kukaiau										10	2		4		1			
Paauhau Sector		1		10	12	1			5	1			8				1	

[1] Including plague in the United States and its possessions.
[2] During the week ended Mar. 18, 1939, 1 case of plague was reported in Algiers, Algeria.
[3] According to information dated Aug. 12, 1938, 23 deaths from plague occurred in Kirin Province, China, up to Aug. 10, 1938, and 16 deaths from plague occurred in South Hin-An Province from July 28 to Aug. 8. Information dated Aug. 25, 1938, states that 17 cases of plague had occurred in South Hsingan Province and that 10 cases of plague with 10 deaths were reported in Northern Kirin Province between July 29 and Aug. 10.
[4] Unofficially reported.
[5] Pneumonic.
[6] For 2 weeks.

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

PLAGUE—Continued

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

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938					January 1939				February 1939			
						3	10	17	24	31	7	14	21	28	4	11	18	25
India	C	907	1,223	2,139	1,723	412	552	299	323	345	474	397						
	D	409	498	975	737	148	231	146	115	232	165	196						
Allahabad	D																	[7] 1
Bassein	C	2	2															
Plague-infected rats					1													
Bombay Presidency	C	49	83	106	136	30	18	25	18	10	7	11	24	9				
	D	27	40	63	65	14	12	18	10	7	5	4	12	8				
Central Provinces and Berar	C	126	412	584	430	181	215	90	148	43	215	195	142	155	170	343	480	421
Cochin	C	1		1	2													
	D	1			2													
Plague-infected rats		2	10	13	6	2		1		3				1				
Madras Presidency	C	227	195	382	215	36	56	20	10	13	40	25	40					
	D	97	88	156	93	11	22	17	2	9	15	13	10					
Rangoon	C	1	2								1		1	1				[7] 1
	D	1	2								1			1				
Madagascar. (See table below.)																		
Peru. (See table below.)																		
Siam:																		
Bisnulok Province	C													1	14	11	4	4
	D													1	1	1	2	1
Lampang Province	C															1		
Prae	C											1	2					
Svargalok Province	C													11	13	2	1	1
Tak Province	C									3			4	3		1	1	1
Tunisia: Tunis	C			2	2		2											
Plague-infected rats					1								2			3		
Union of South Africa	C		3					2				[6] 6		[6] 2		[6] 9		
Cape Province—Port Elizabeth	C	2	1	1						1								
	D									1								
Orange Free State	C								2	3								
United States.[8]																		

Place		August 1938	September 1938	October 1938	November 1938	December 1938	January 1939
Argentina: Salta Province	C	1	1				
Bolivia (see also table above)	C	4	[9] 103				
Brazil:							
Alagoas State	C			1		5	
Pernambuco State	C	4	4	20	17	17	
Rio de Janeiro State	C				11	1	
Madagascar (central region)	C	33	60	70	73	107	
	D	31	60	64	64	102	
Peru	C	4	7	6	6	7	14
Lambayeque Department	C						2
Libertad Department	C	1			3	2	11
Lima Department	C	3	6	6	2	4	1

[6] For 2 weeks.
[7] Imported.
[8] Last reported human case, Aug. 30, 1937, Fresno County, Calif. Intensive plague work is being conducted in the Western States and detailed reports of plague-infection found in animals and insect hosts are published currently in the PUBLIC HEALTH REPORTS. The following summarizes recent reports for 1938: *Arizona*—Insects, Sept. 27, *California*—Ground squirrels, August, October, Dec. 11; insects, August, October; Dec. 22; *New Mexico*—Prairie dogs, August, September; insects, August, September; *Wyoming*—Insects, August.
[9] For the period Sept. 8–Oct. 7, 1938.

SMALLPOX

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938: 3	10	17	24	31	January 1939: 7	14	21	28	February 1939: 4	11	18	25
Algeria:																		
Algiers Department	C			1														
Constantine Department	C	1																
Philippeville	C	1																
Angola. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil. (See table below.)																		
British East Africa: Tanganyika	C	94	80	38	46						1				144		21	
Canada:																		
Alberta	C																36	1
British Columbia	C															4		
Manitoba	C									[1] 1	5	1	2				1	
Ontario	C	9		1	2			[1] 1		[1] 1								1
Saskatchewan	C		[1] 1	[1] 2	9			[1] 3		[1] 2	8	1	7	1	10			

[1] For 2 weeks.

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

SMALLPOX—Continued

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

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended— December 1938 3	Dec. 10	Dec. 17	Dec. 24	Dec. 31	January 1939 7	Jan. 14	Jan. 21	Jan. 28	February 1939 4	Feb. 11	Feb. 18	Feb. 25
China:																		
Amoy	C				2													
Dairen	C					1				1		1						
Foochow	C										5							
Hankow	C			1														
Hong Kong	C				2	3	1	9	11	6		5	7	6	8	4	7	26
	D						5	4	8	6		2	6	5	5	5	5	8
Shanghai	C	7	4	53	318	222	211	339	297	195	247	242	188	157	107	64	48	55
Swatow	C												1		2	1		
Tientsin	C						2											
Chosen (Korea). (See table below.)																		
Colombia (see also table below): Cartagena	D																1	
Dahomey. (See table below.)																		
Dutch East Indies:																		
Batavia	C		[2] 1															
Surabaya	C							[2] 1										
Ecuador: Guayaquil. (See table below.)																		
France. (See table below.)																		
Great Britain: England and Wales—																		
Lancaster County	C	3																
Liverpool	C									1		1						
York County	C				3													
Greece. (See table below.)																		
Guatemala. (See table below.)																		
India	C	1,635	1,206	1,225	1,628	881	1,106	1,025	1,101	1,222	1,611	1,384	1.868					
	D	510	330	259	401	218	282	303	273	301	357	286	448					
Allahabad	C													1				
Assam	C	49	10	33	39	16	5	3	28	28	27	19		21	6	26	21	
Bengal Presidency	C	166	123	146	160	58	54	74	56	58								
	D	59	51	49	29	12	7	20	24	20								

Bombay Presidency	C	401	281	361	214	100	172	126	145	138	295	283	356	454				
	D	77	37	51	27	13	19	25	17	17	39	38	63	47				
Bombay	C	15	9	5				1		1	2		3	7	4	3	7	
	D	11	3					1			2		2	4	3	2	2	
Calcutta	C	31	28	10	42	10	17	30	24	35	71	89	100	140	196	194	184	202
	D	23	18	7	17	6	5	21	18	16	30	48	76	77	99	137	103	112
Central Provinces and Berar	C	28	15	14	3	2	21	12	11		21	5	34	21	41	40	39	78
Cochin	C						1										2	2
Delhi	C		1		5	5	1	3	10	4	14	25	18	39	26	15	31	41
Howrah	C	17	27	18	5	5	2	4	5	5	13							
Jodhpur	C		1															
Karachi	C	1			[1] 1					[1] 3	1		1	1	1		2	
Madras Presidency	C	511	306	281	363	155	190	147	239	162	176	187	328					
	D	98	64	50	55	25	35	26	39	43	29	229	54					
Madras	C	132	100	81	160	32	49	32	29	44	26	17	57	71	60	99	73	72
Moulmein	C				4								1					
Northwest Frontier Province	C	75	24	37	75	68	56	99	44	23	96	20	39		21	16	33	43
Orissa Province	C	258	119	46	35	30	34	47	63	34	40	45	126	127	77	134	119	135
Punjab	C	16	13	10	57	40	13	16	49	17	43	31	38	84	92	65	118	54
Rangoon	C	6	4	3	5				1	1	4	2	2	1	1		1	3
Sind State	C	112	63	29	119	40	59	94	22	87		73	85		85	83	39	92
India (French): Chandernagor Territory	C	3						1										
Indochina (French) (see also table below):																		
Tonkin Province	C	45	46	34	95	35	41	23	99	69	57	19	68	70	35	59	49	40
Haiphong	C														2			
Hanoi	C													1	1	3	2	4
Saigon-Cholon	C	3	7	9		2		3	2	5	3		1	2		[1] 1		
Iran	C	1		3						1			1					
Iraq	C		3					1			5		1					1
Ivory Coast. (See table below.)																		
Japan:																		
Kanagawa Prefecture	C												1					
Kobe	C						1	2			1		1	2	2	38		
Nagasaki	C					5	2											
Okayama Prefecture	C				1	1												
Tokyo	C							1	1						2	1		
Lithuania. (See table below.)																		
Malta. (See table below.)																		
Mexico (see also table below):																		
Mexico, D. F	C	1								1				1				
Monterrey	C	3												4	1		1	
San Luis Potosi	D															2	2	1
Tampico	C				1										1		2	4
Morocco. (See table below.)																		
Nigeria	C	280		156	87				182		170	59	91					
Calabar	C										1							
Lagos	C	1	13	7														
Port Harcourt	C												3					

[1] Imported.

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

SMALLPOX—Continued

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

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 24, 1938	Sept. 25–Oct. 29, 1938	Oct. 30–Nov. 26, 1938	Week ended—												
						December 1938					January 1939				February 1939			
						3	10	17	24	31	7	14	21	28	4	11	18	25
Niger Territory. (See table below.)																		
Northern Rhodesia	C	6	6	9			2	4										
Nyasaland	C	1	6	3														
Portugal (see also table below).																		
Lisbon	C	5	5	8	20		2	2	1	1	2	3	12	25	2	12	3	4
Oporto	C		1	10			3		2			4	1		3	3	3	5
Salvador. (See table below.)																		
Siam	C		33						2	4	25	22	1					
Sierra Leone	C					1		1						[1] 4				
Southern Rhodesia	C	403	97	57	125		15	9	3	3		7	24	6	18			
Sudan (Anglo-Egyptian)	C	4	2	30	20	12	6	1	7	5	4	12	6	6		16		2
Union of South Africa. (See table below.)																		
Venezuela. (See table below.)																		

On vessels:

S. S. *Planter* at Aden	1 case	Aug. 2, 1938
S. S. *Pronto* at Tangku-Taku from Hong Kong	1 case	Aug. 8, 1938
S. S. *Defender* at Aden	1 case	Aug. 19, 1938
S. S. *Katori Maru* at Kobe from London, Singapore, Hong Kong, and Shanghai	3 cases	Aug. 20, 1938
S. S. *Conte Biancamano* at Suez from Shanghai, Colombo, Bombay, and Massowah	1 case	Sept. 10, 1938
S. S. *Hartlebury* bound for New York via Durban [2]	1 case	Dec. 1, 1938
S. S. *Nagasaki Maru* at Nagasaki from Shanghai	1 case	Dec. 7, 1938
S. S. *Pyrrhus* at Yokohama from Shanghai	1 case	Dec. 10, 1938
S. S. *Westpoint* at sea en route Surabaya	1 death	Do.
S. S. *Tyles* at Yokohama from Hong Kong and Shanghai	1 case	Dec. 13, 1938

On vessels—Continued.

S. S. *Nagasaki Maru* at Nagasaki from Shanghai	1 case	Dec. 16, 1938
S. S. *Bellerophon* at Hong Kong from Yokohama, Kobe, and Shanghai	1 case	Dec. 22, 1938
S. S. *Selandia* at Singapore from Saigon	1 case	Jan. 15, 1939
S. S. *Pottsdam* at Singapore from Yokohama	1 case	Jan. 17, 1939
S. S. *E. Sang* at Swatow from Shanghai	1 case	Jan. 18, 1939
S. S. *Maihar* at Aden from Calcutta	1 case	Jan. 30, 1939
S. S. *Alavi* at Aden from Bombay	1 case	Feb. 2, 1939
S. S. *Orange Moor* at Saigon from Shanghai	1 case	Do.
S. S. *Queen Victoria* at Victoria from Shanghai	1 death	Feb. 6, 1939

[1] For 2 weeks.

[2] Patient removed from vesse land died in hospital in Iloilo district, P. I.

Place		August 1938	September 1938	October 1938	November 1938	December 1938	January 1939
Angola	C	62					
Belgian Congo	C	163	185	354	357	211	
Bolivia:							
Cochabamba Department	C	[4] 2	[5] 1		[6] 4		
Chuquisaca Department	C	[4] 3					
La Paz Department	C	[4] 27	[5] 16		[6] 19		
Oruro Department	C		[5] 4		[6] 1		
Potosi Department	C				[6] 15		
Santa Cruz Department	C	[4] 8	[5] 7		[6] 2		
Tarija Department	C				2		
Brazil:							
Bahia	C	1		5	1	1	
Porto Alegre	C	1					
Chosen (Korea)	C				1		
Colombia	C	68	60	74		[7] 122	
Dahomey	C	16			15	14	12
Ecuador: Guayaquil and vicinity	C			3	6	2	
France	C		1				
Greece	C				3	5	12
Guatemala	C	1			16		
Indochina (French) (see also table above)	C	206	113	166	174	475	
	D	48	35	25	14	65	
Ivory Coast	C	10			25		18

Place		August 1938	September 1938	October 1938	November 1938	December 1938	January 1939
Lithuania	D	1					
Malta	C					9	
Mexico (see also table above):							
Aguascalientes State—Aguascalientes	C		2	6		6	
Colima State	C		1				
Hidalgo State	C			30	7	36	
Mexico, D. F.	C	1	2		2	6	
Nuevo Leon State—Monterrey	C	3					
Queretaro State	C	16	3				
San Luis Potosi State—San Luis Potosi	C				7		
Sonora State	C	1					
Morocco	C	1			3	4	2
Portugal (see also table above)	C	40	78	72	169	62	
	D	4	3	7	12	12	
Salvador	C			1			
Union of South Africa:							
Cape Province	C	1	1			1	
Natal	C	25	1				
Orange Free State	C	1					
Transvaal	C	33	18			37	
Venezuela	D	3	3	1			2

[4] For the period Aug. 1 to Sept. 7, 1938.
[5] For the period Sept. 8 to Oct. 7, 1938.
[6] For the period Oct. 8 to Nov. 30, 1938.
[7] For November and December.

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

TYPHUS FEVER

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

Place		July 31-Aug. 27, 1938	Aug. 28-Sept. 24, 1938	Sept. 25-Oct. 29, 1938	Week ended— November 1938 5	Nov. 12	Nov. 19	Nov. 26	December 1938 3	Dec. 10	Dec. 17	Dec. 24	Dec. 31	January 1939 7	Jan. 14	Jan. 21	Jan. 28	February 1939 4	Feb. 11	Feb. 18
Algeria:																				
Algiers Department	C	5	2	6	1	1	3	1	7		13		7	1	2	1	5	10		2
Algiers	C						3		5							1	1			
Constantine Department	C	20	25	8		2	1	3	5	17	11	1	10	6	13	28	68	32	20	26
Bone	C	4		1		1											4			
Constantine	C	1	1			1				3			4			11		7		
Philippeville	C	7	11	3	1				3						1	1	1	1		
Oran Department	C	12	1	5	4							1	4	16	7	3	2	5	16	4
Basutoland	C	3	1																	
Belgium. (See table below).																				
Bolivia. (See table below).																				
British East Africa: Kenya	C	3	2		3							1	2							
Chile	C	40	81	72			[1] 57				[2] 85			[2] 79						
Antofagasta Province	C			5																
Concepcion	C			1																
Coquimbo Province	C	1																		
Curico Province	C													[2] 23						
Llanquihue Province	C		16																	
Nuble Province	C	16	10	1																
Santiago Province	C	14	39	31										[2] 25						
Tarapaca Province	C	1																		
Valdivia Province	C	1	4	2																
Valparaiso	C	1	2	4	2		1	1			1	1	3							1
China (see also table below):																				
Dairen	C				1							1								
Shanghai	C		8	7												5	1			
Tientsin	C														2					
Chosen (Korea). (See table below.)																				
Czechoslovakia. (See table below.)																				
Egypt:																				
Alexandria	C	1	1									1	1							
Asyut Province	C	2	2														1	2		
Beheira Province	C	6	10														1	1	3	12
Cairo	C	2	1								1		1		1	1	1	1	1	13
Dakahliya Province	C																			

Gharbiya Province	C	6	8	8													15	7	23	13
Girga Province	C	1	5	1													4	7	11	18
Giza Province	C	1																1	10	2
Kalyubiya Province	C	1																8	3	15
Minufiya Province	C																3	14	13	13
Minya Province	C	1		1																
Sharkiya Province	C		1															3	8	5
Provinces	C	95	28	32		2	1	5			18	11	14	2	9	34	25	43	90	98
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	3	4	5	3	2	3		3	1		2	1		1			1		
Hungary	C										1	1	1				1			
Iran	C					1														
Iraq	C	1	3	1					1		1									1
Latvia. (See table below.)																				
Libya:																				
Garian	C	1																		
Suani Benaden	C														3					
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Guadalajara	D								1											
Mexico, D. F.	C	1	6	10	2	2	5	1	4		1	3	1		4	1				
Monterrey	C			1																
Nuevo Laredo	D							2												
San Luis Potosi	D											1								
Torreon	D	2		2							1									
Morocco	C	55	11	9	16		39	27		41	20	19	37	31	27	34	19	13	43	39
Casablanca	C	5														1			1	1
Palestine:																				
Haifa	C		3	3		1	1		1											
Jaffa	C	4	9	9						3		2	1				3			
Poland	C	58	37	64	18	24	25	27	67	43	47	104	60	77	62	79	119	121	138	111
	D		1	3	3	1	1	1	2	1	5	6	6	7	2	3	2	5	6	6
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Straits Settlements: Singapore	C	1				1											2	2		
Syria:																				
Beirut	C			1					1											
Lebanese Republic	C			1																
Trans-Jordan	C			1			1													
Tunisia:																				
Tunis	C	3	9	19	3	5	3		32			8	2	8	13	7	15	7	6	12
Provinces	C	86	73	40			12			49	117	49	46	106	112	84	134	41	182	173
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia	C	11	7	14		2	2	1	3	16	3	3			5	6	10	13	10	

[1] For 2 weeks.
[2] For 3 weeks.

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

TYPHUS FEVER—Continued

Place		August 1938	September 1938	October 1938	November 1938	December 1938	January 1939
Belgium: Brussels	C		2				
Bolivia:							
Cochabamba Department	C	[3] 1					
La Paz Department	C		[4] 6		[5] 14		
La Paz	C	[3] 1	[4] 3		[5] 11		
Oruro Department	C	[3] 1	[4] 1		[5] 3		
Potosi Department	C	[3] 7					
Santa Cruz Department	C				[5] 1		
China: Manchuria—Harbin	C	2	5	2	16		
Chosen (Korea)	C	1	12		21		
Czechoslovakia	C	3					
Greece	C	5	11	4	10		
Guatemala	C	20	6	3	38	2	9
Latvia	C				1		
Lithuania	C				3		
Mexico (see also table above):							
Aguascalientes State—Aguascalientes	C			1		2	
Hidalgo State	C	4	1	5	1	1	
Jalisco State—Guadalajara	C		1				
Mexico (see also table above)—Continued.							
Mexico State	C		4	6	7		
Mexico, D. F.	C	5	10	10	13	6	
Nayarit State	C				1		
Oaxaca State	C			2	3		
Puebla State—Puebla	C		1	2	3		
Queretaro State	C	1	1	1	2	1	
San Luis Potosi State—San Luis Potosi	C		1	2	1	5	
Tamaulipas State	C	1					
Portugal	C	2	2		7	3	
Rumania	C	5	8	27	77	100	
Turkey	C		17	13	21		
Istanbul	C	2	5	2	2		
Union of South Africa:							
Cape Province	C	62	165		91	93	
Natal	C	1	4		8	1	
Orange Free State	C		7		2		
Transvaal	C	1					

[3] For the period Aug. 1 to Sept. 7, 1938. [4] For the period Sept. 8 to Oct. 7, 1938. [5] For the period Oct. 8 to Nov. 30, 1938.

YELLOW FEVER

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

Place		July 31–Aug. 27, 1938	Aug. 28–Sept. 21, 1938	Sept. 25–Oct. 29, 1938	Week ended— November 1938				December 1938					January 1939				February 1939			
					5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25
Belgian Congo: Buta	C							[1] 1													
Brazil:[2]																					
Espirito Santo State	D																4	4	6	13	16
Minas Geraes State	D																		4	1	3
Rio de Janeiro State	D														1	1					
Colombia: Cundinamarca Department	D	2																			
French Equatorial Africa:																					
Chad—Fort Lamy	C														1						
Sosso	C					1															
Gold Coast	C		3	4																	[1] 1
	D		1	1																	
Ivory Coast	C			3		[3] 2	3	3	[3] 2		[3] 3								1		1
	D	1									2								1		
Nigeria	C	[1] 2	1	1		1	2	1		[1] 1	[1] 1	1			2			[1] 2		[1] 2	
	D	[1] 1																			
Port Harcourt	C							1													
Sudan (French):																					
Kona	C							[1] 1	3												
Kouy	C		[1] 1																		
Sangha	C									1											
Tougan	C			3																	
On vessel: S. S. *St. Octave* at Grand Bassam Roadstead from Bordeaux, Dakar, Konakry, Tabou, and Sassandra	C								1												

[1] Suspected.
[2] See also reports of yellow fever in Brazil in preceding issues of the PUBLIC HEALTH REPORTS.
[3] Includes one suspected case.

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