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THE CHEMISTRY OF CELL DIVISION

III. INHIBITION OF CELL DIVISION OF AMOEBA PROTEUS BY HIGH DILUTIONS OF COPPER SALTS—ANTAGONISM OF COPPER AND GLUTATHIONE

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INTRODUCTION

In the first paper of this series (Voegtlin and Chalkley, 1930) it was pointed out that the complicated process of cell division in all probability is regulated by chemicals occurring normally in cells in *relatively low* concentrations. Evidence was presented which clearly showed that one of these chemicals, glutathione, favors the division of *Amoeba proteus* under survival conditions. The stimulating action of low concentrations of glutathione was particularly pronounced on the division of the nucleus. We also suggested that the traces of heavy metal compounds, which physiologically are widely distributed in animal cells, may play a rôle in cell division. In recent years numerous facts have been discovered indicating that iron and copper particularly are concerned in a variety of biochemical and physiological processes. A systematic study of the action of copper salts on cell division, therefore, appeared to be of considerable interest, particularly so as the work of Voegtlin, Johnson, and Dyer (1925) indicates strongly that the toxic action of low concentrations of copper on various living organisms is explicable in terms of its chemical affinity for the sulphydryl groups in living cells. Recent work from this laboratory (Voegtlin, Johnson, and Rosenthal, 1931) furthermore shows that copper *in vitro* is a powerful catalyst in the oxidation of reduced to oxidized glutathione, whereas under the same conditions iron salts are inactive. We therefore decided to investigate the action of copper salts on the division of *Amoeba proteus* and also to determine whether or not there is any evidence of a biological antagonism of copper and glutathione with respect to cell division and toxic action.

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MATERIAL AND METHODS

The *Amoeba* used were from a single clone derived from a strain of *Amoeba proteus* (Schaeffer, 1916) originally secured from the Johns Hopkins University by courtesy of Prof. S. O. Mast. They were cultured by the method previously employed by Voegtlin and Chalkley (1930). All solutions were made with doubly glass-distilled water, and all glassware was thoroughly cleaned in order to remove traces of heavy metals. The cupric chloride was prepared by recrystallization from C.P. materials. We are indebted to Dr. J. M. Johnson for the glutathione used in this investigation. This reduced glutathione (GSH) was prepared by the cadmium method of purification described by Voegtlin, Johnson, and Rosenthal (1931). It analyzed as follows: N 13.67 and 13.70; S 10.76 and 10.76. The material did not react with the latest modification (1930) of the Sullivan reaction for cysteine, and from all information it must be considered as being a very pure material, free from all but infinitesimal traces of copper.

All solutions were buffered by the addition of small amounts (2 to 5 cubic centimeters M/20 buffer to the liter of solution) with Clark and Lubs phosphate buffer and the pH was checked colorimetrically before and after each experiment. All cells were isolated so that the occurrence or nonoccurrence of divisions could be accurately ascertained. The general procedure was as follows:

Each *Amoeba* was removed from the culture with a capillary pipette, washed thoroughly in standard saline,[1] and placed on a depression slide in a drop of the same saline. Then, by repeatedly drawing it up and ejecting it from a capillary pipette, the cell was stimulated until it assumed a spherical shape. Its diameter was then measured by means of a compound microscope with eyepiece micrometer, using 20X ocular and 16-millimeter apochromat objective and the volume was calculated. The cell was then transferred in saline to a cover glass in a hanging drop, which was set aside inverted. When the *Amoeba* had attached to the cover glass and was sufficiently spread out, the cell was placed on the stage of the microscope and examined to insure that it was mononucleate. If necessary for the experiment the nucleus was measured with the micrometer (using a 20X ocular and 4-millimeter apochromat), its three dimensions were ascertained, and the volume was calculated on the assumption that it was in general ellipsoidal in shape. Then the *Amoeba* was transferred to a clean 25 cubic centimeter pyrex beaker containing 2 cubic centimeters of the solution to be used in the contemplated experiment. Each *Amoeba* and any cell originating from it was similarly

[1] The solution referred to as "standard saline" is that used in culture and is made up as follows: 0.1 gram NaCl, 0.04 gram KCl, 0.06 gram $CaCl_2$, distilled H_2O to make 1,000 cubic centimeters of solution.

examined every 24 hours thereafter until the experiment was completed, and at each examination both beaker and solution were renewed. The *Amoebae*, both cultures and experimental organisms, were kept in a constant temperature room at 21° C., except during the time of handling and examination.

This procedure was followed throughout except in certain experiments described later, where the exceptions are noted.

THE ACTION OF COPPER ON AMOEBA AS CONTRASTED WITH THAT OF SH GLUTATHIONE

(A) COPPER SALTS IN HIGH CONCENTRATIONS

To ascertain the effect of relatively high concentrations of copper salts, two experiments were performed. Three *Amoebae* were used in each experiment, one small (0.0005 to 0.001 cubic millimeter), one medium (0.001 to 0.003 cubic millimeter), and one large (0.004 to 0.008 cubic millimeter) in volume. The procedure as previously outlined was departed from in that after washing and measuring the cells they were transferred to a drop of the experimental copper salt solution placed on a cover glass, instead of to beakers, and a hanging drop preparation was made. This was done so that close and repeated observations and measurements of the cells could be made during the experimental period.

In the first experiment the three *Amoebae* were immersed in m/1000 $CuCl_2$ made up in standard saline buffered to pH 7.0. Then they were placed under the microscope and the volume of each was ascertained at frequent intervals. The changes in volume found were expressed as per cents of the original cell volume and plotted against the time from the moment of immersion. The resulting curves are presented in Figure 1. It will be seen that immediately after immersion the volumes of all the *Amoebae* increased very rapidly to a maximum, which was reached in approximately 10 minutes. This increase was followed by a slight decrease in the volumes over a period of from 15 to 45 minutes and then succeeded by a relatively slow increase in the volumes that continued in each case until cytolysis of the cell occurred by rupture of the membrane.

In the second experiment, NaCu citrate was used instead of $CuCl_2$. From the curves derived from the measurements on these *Amoebae* (fig. 1) it would seem that the only significant difference between the two groups is the lessening of the initial degree of swelling and the lengthening of the time to complete cytolysis in the group in the NaCu citrate solution. One cell in this group underwent partial cytolysis by rupture about 30 minutes after immersion. The rupture healed, however, and swelling recommenced, only to be again followed by a slight rupture. From this apparently there was only partial recovery, since it was followed by a slow decrease in volume which continued

until the sudden and complete breakdown of the cell membrane 130 minutes after immersion.

From the similarity in the results of these two experiments it appears that the action of both salts must be ascribed to the common factor, copper. The primary effect of exposure is an increase in the

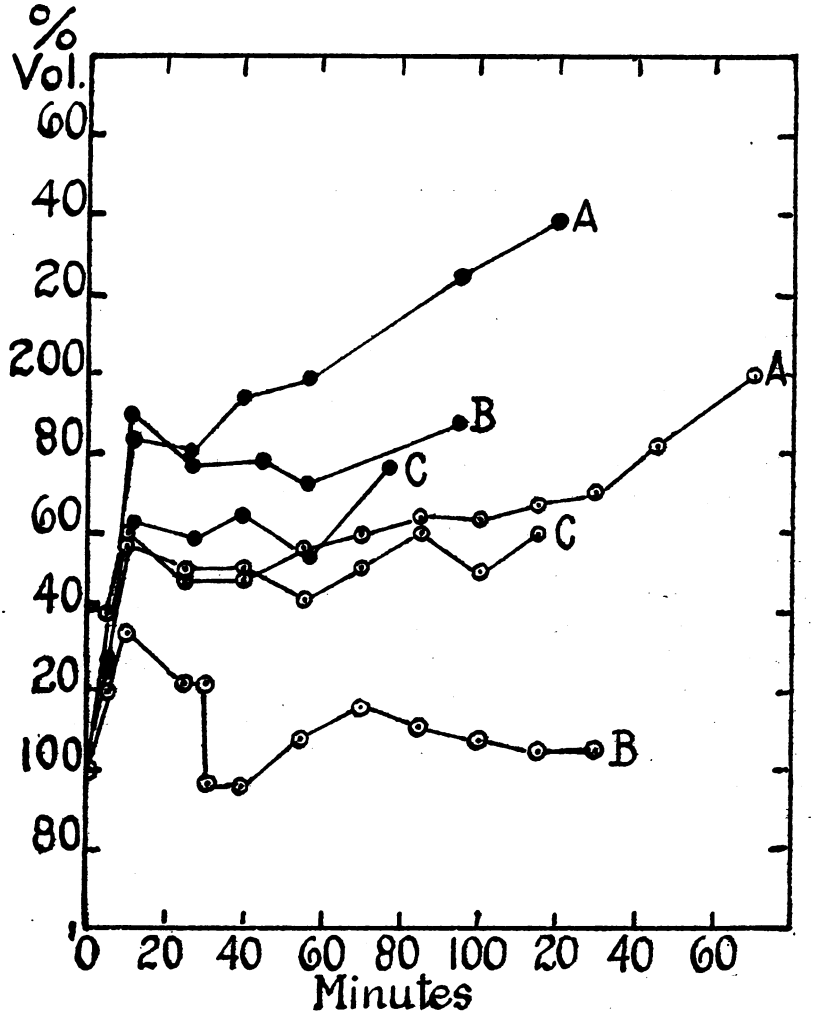

FIGURE 1.—Graph showing the per cent changes in volume of six *Amoebae*, three immersed in a m/1,000 solution of $CuCl_2$ and three in a m/1,000 solution CuNa citrate. Solid symbols, curves for *Amoebae* in $CuCl_2$; open symbols, curves for *Amoebae* in CuNa citrate. (*A*) *Amoebae* approximately 0.001 cubic millimeter in volume; (*B*) Amoebae approximately 0.004 cubic millimeter in volume; (*C*) *Amoebae* approximately 0.008 cubic millimeter in volume

volume of the cell, probably (since the effect is rapid) produced through osmotic intake of water by reason of changes induced in the cell membrane. This idea is supported by the fact that this initial swelling is followed by a slight shrinkage, which would seem to be

indicative of a reaction tending to partially offset this primary effect. This, it seems, could hardly occur if the entire cell content were affected. Furthermore, the fact that partial breaks in the membrane are followed by immediate and rapid loss of volume, complete repair by resumption of swelling and partial repair by slow shrinkage, certainly indicates that the membrane condition is responsible for the swelling.

We may conclude, therefore, that the death of *Amoeba* in this relatively high concentration of copper salts is essentially due to rupture of the membrane under osmotically induced pressure, which becomes effective owing to the effect of copper upon the permeability of the cell membrane. We next investigated the effect of more dilute solutions of copper salts.

(B) THE EFFECT OF COPPER IN HIGH DILUTION

In these experiments the procedure outlined in the section on Materials and Methods was employed. The *Amoebae* used as controls were immersed in standard saline and an equal number were exposed to the copper solution, all solutions buffered to pH 7.0. In each experiment both the cell and nuclear volume of each *Amoeba* were measured at the beginning of the test and at 24-hour intervals thereafter. All experiments were run for three days, except as noted later. After the experiment had been completed, the *Amoebae* were grouped in respect to cell volume with a class interval of 0.0005 cubic millimeters. The percentage change in volume in terms of the original volume was calculated for each *Amoeba* for both cell and nucleus for each time interval. The percentages thus obtained were averaged for each time interval, yielding the average percentage change in volume for cell and nucleus, respectively, for each 24 hours of the period of experimentation. In addition, the percentage of nuclear division and mortality relative to the original number of *Amoebae* was calculated for each 24 hours, and in certain tests (as noted below) the number of food vacuoles was found per 100,000 cubic micra of living cell substance at the beginning and at the end of each 24-hour period. All of these values were then plotted as a function of the time in days.

In the first test 10 cells were exposed to a m/500,000 $CuCl_2$ solution and 10 were used as controls. The control cells averaged 0.0014 and the experimental 0.00125 cubic millimeter in volume, with the volumes falling in the class interval from 0.001 to 0.0015. Due to the high mortality in the copper-treated organisms the experiment was terminated at the end of 48 hours. The results are presented in Figure 2. Looking first at the curves for the copper-treated cells, it is at once obvious from the figure that the solution is strongly toxic. All the copper treated *Amoebae* were dead at the end of 48 hours and, as was to be expected, no increase of cell volume, such as might indi-

cate growth, was found in the living cells at the end of the first 24 hours. No data were obtainable for the living nuclei, inasmuch as in all surviving *Amoebae* the cells had assumed a spherical shape and the nuclei were so obscured by superimposed granules that no measurements were possible. All the cells which died in $CuCl_2$ solution were found. They were all dark and coagulated. In 8 out of the 10 the cell membrane was only in part persistent; in the other 2 it was apparently intact. In the cells exhibiting only partial persistence of the membrane there appeared to have occurred a rupture as in all cases a protruding irregular mass of coagulated protoplasm was

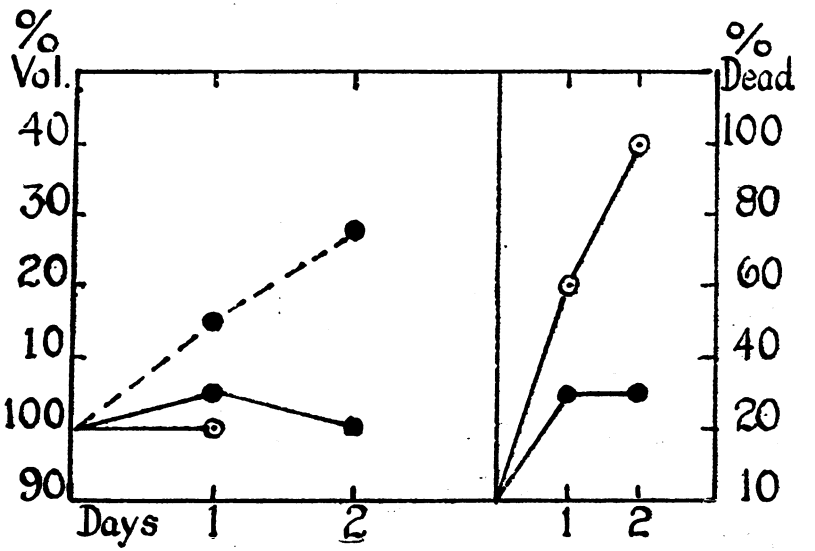

FIGURE 2.—Graph showing per cent changes in volume of nucleus and cell and per cent mortality for *Amoebae* with original cell volumes from 0.001 to 0.0015 cubic millimeter immersed in m/500,000 $CuCl_2$ solution as compared with *Amoebae* immersed in standard saline. Solid symbols, *Amoebae* in saline; open symbols, *Amoebae* in $CuCl_2$ solution. Dotted line, per cent nuclear volume; solid line, per cent cell volume. (Note: No data obtainable on nuclear volume in $CuCl_2$, see text)

seen that had every appearance of having been extended from a rupture in the membrane. The nuclei, where visible, were dark and brownish in color and seemed shrunken. It seems probable that in most cases the cells had burst, as in the experiment in m/1000 $CuCl_2$ and then coagulation of the cell followed. Turning to the controls it will be seen that they show a low death rate and an increase in the average volume for both nucleus and cytoplasm. It is striking that the increase in nuclear volume persists for 48 hours, while at 24 hours, the cell volume reaches a maximum and has, within experimental error, resumed its original value at the end of the second day. The cells that died were not found, as they normally disintegrate shortly after death in this solution.

As it was evident that such a high concentration of $CuCl_2$ had been employed as to prevent measurement of changes in nuclear volume by reason of pathological change, we made our next test with a $CuCl_2$ concentration of m/50,000,000. In this test 40 *Amoebae* were used, 20 in the $CuCl_2$ solution and 20 in the control saline. The average volumes for the groups were 0.0011 for controls and 0.0011 for the organisms treated with $CuCl_2$, respectively; all volumes fell in the class interval 0.0010 to 0.0015 cubic millimeter. The curves obtained are presented in Figure 3. It will be noted that the surviving copper-treated *Amoebae* show, on an average, an increase in cell volume in the first 24 hours, followed by a decrease during the subsequent two days.

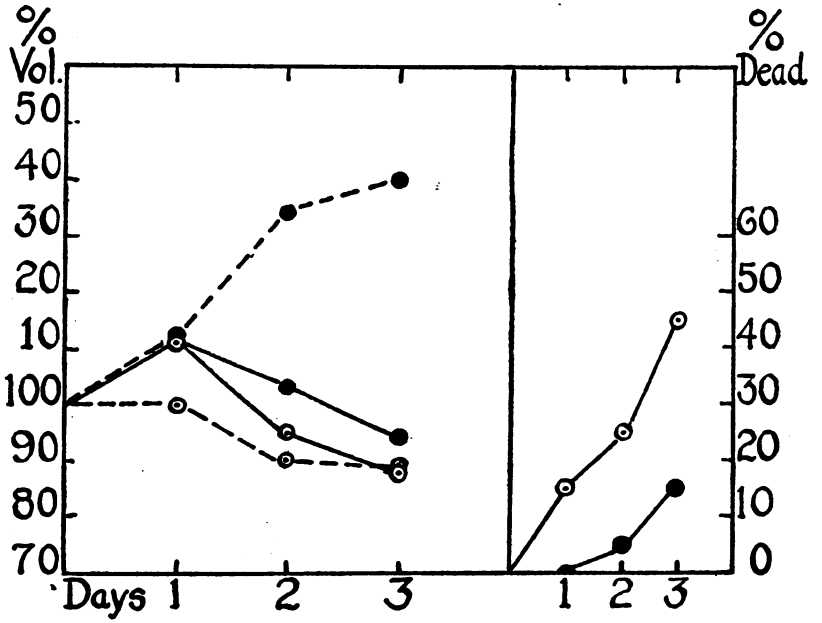

FIGURE 3.—Graph showing per cent changes in average volume of cell and nucleus in *Amoebae* with original cell volume between 0.001 and 0.0015 cubic millimeter immersed in m/50,000,000 $CuCl_2$ solution and in standard saline (Graph A) and the per cent mortality in the same (Graph B). Dotted lines (in A), nuclear volume; solid lines (in A), cell volume. Solid symbols, *Amoebae* in standard saline; open symbols, *Amoebae* in $CuCl_2$ solution

The average nuclear volume, however, remains practically stationary for 24 hours and then decreases. There is again a very high death rate, 45 per cent by the end of the 3-day period, indicating that the solution is still quite toxic. The dead cells were gelated similarly to those in the previous experiment. The curves for the contols, it will be seen, are similar to those obtained in the preceding experiment.

The course of the curves for the average nuclear volume in this experiment suggested that copper in still higher dilution might exhibit as its principal effect an inhibitory action on nuclear growth (increase

in volume), and possibly on cell growth also. Such effect might, if Chalkley's observations (Chalkley, 1931) as to the close correlation of cell growth and the nucleo-cytoplasmic ratio with the occurrence of division under cultural conditions be considered, result in inhibition of either nuclear or cell division, or both, below that to be found in the controls. In addition, we knew from the results obtained by Voegtlin and Chalkley (1930) that glutathione would increase the percentage of division in cells subjected to its influence above that found in the controls. It seemed from these two considerations that it was entirely possible that the effects of copper and glutathione on *Amoeba* might be antagonistic, possibly not only in respect to division but also in respect to the changes in volume we were investigating. To ascertain if this were true, however, we must have closely comparable data for both glutathione and copper. Therefore, in the next experiment, in addition to subjecting *Amoebae* to $CuCl_2$ (m/500,000,000 to further reduce the mortality), we also subjected other *Amoebae* to the action of m/100,000 GSH.

Six experiments were made with $CuCl_2$ and five with SH glutathione, employing 220 *Amoebae*. For the convenience of the reader, however, the results have been combined, as they were consistent throughout when the *Amoebae* were separated into the several class intervals for volume. They were found to be distributed in these intervals, as follows: Cells from 0.0010 to 0.0015 cubic millimeter in volume, 30 in $CuCl_2$, 16 in GSH, 42 in the control; cells from 0.0015 to 0.0020, 14.5 in $CuCl_2$, 20 in GSH, and 30 in the control; cells from 0.0020 to 0.0025, 15.5 in $CuCl_2$, 14 in GSH, and 38 in the control.

In addition to the curves obtained as heretofore for cell volume, nuclear volume, mortality, and division, curves were plotted for the disappearance of food vacuoles in all groups. These last were obtained as follows: The number of food vacuoles in each cell was recorded at each examination, summed up for each group of cells, and divided by the total volume of living protoplasm, in units of 0.0001 cubic millimeter, giving the average number of food vacuoles per 0.0001 cubic millimeter of protoplasm found at each examination for each group. These values were plotted as usual as a function of the time in days. Since there was no food intake during the experiment the values so plotted represent roughly the average rate at which the food originally in the *Amoebae* disappeared during the experimental period in each group. The error involved can not at this time be estimated, owing mainly to the fact that no distinction could be made between digested and ejected food. The results, therefore, must be considered as tentative, and any conclusion as to digestive process is based on the assumption that the disappearance is due to digestion at least in the main, and not to ejection of the vacuolar contents, without chemical change.

It appeared of interest to determine whether the copper-treated cells surviving the experimental period had been greatly injured. At the completion of one of the tests with copper, therefore, the surviving cells both from the control and copper solution were individually transferred to separate beakers containing a lavish supply of food organisms and the observations and measurements were continued. The results of all these experiments are presented in Figures 4 to 9. These show, respectively, (1) the curves obtained for the average per cent change in volume in cell and nucleus for *Amoebae* immersed in m/100,000 GSH, in m/500,000,000 $CuCl_2$, and in standard saline for each of the three class intervals for average original cell volume, namely, 0.001 to 0.0015, 0.0015 to 0.002, and 0.002 to 0.0025 cubic millimeter; (2) the same curves grouped to bring together all curves obtained in m/100,000 GSH, m/500,000,000 $CuCl_2$, and in standard saline, respectively; (3) the curves for average percentage of division in each of the class intervals in m/100,000 GSH, m/500,000,000 $CuCl_2$, and in standard saline, respectively; (4) the curves for average percentage mortality similarly grouped; (5) the curves for the disappearance of food vacuoles similarly grouped; and (6) the curves obtained for the test in which feeding was resumed after the usual 3-day interval of starvation.

From Figure 4 it will be seen that, in general, growth of nucleus is most rapid (or in the case of the $CuCl_2$ treated cells is least inhibited) in the small, less in the medium, and least in the large cells. Average nuclear growth is most rapid in all cell sizes in the GSH solution, less rapid in the saline, and least in the $CuCl_2$ solution. In the latter, in fact, there is practically no growth in the cells averaging 0.0015 to 0.002 and shrinkage in the cells averaging 0.002 to 0.0025 cubic millimeter in volume. Although not so marked as the variations in nuclear growth, the cell growth also shows variation with the original cell volume. Except in the small cells where, in the saline controls, the cell grows during the first 24 hours, the cell volume decreases with the time of starvation in all solutions. Apparently this decrease tends to increase as the average original cell volume is increased. Cells immersed in saline suffer this decrease least throughout the range of cell volumes used. No significant difference appears, however, in this respect as between cells in GSH and $CuCl_2$.

In view of the finding of Chalkley (1931) that, under cultural conditions, the average rate of growth declines with the age (volume) of the cell, it appears that these differences with original cell size should be ascribed to internal factors correlated with the age of the cell. This influence of age—i. e., cell volume—is still more forcibly brought out in Figure 5. Here, if comparison of the curves is made as to the three class intervals for original cell volume in each of the three groups (GSH, $CuCl_2$, and controls) at the maximal growth point for each

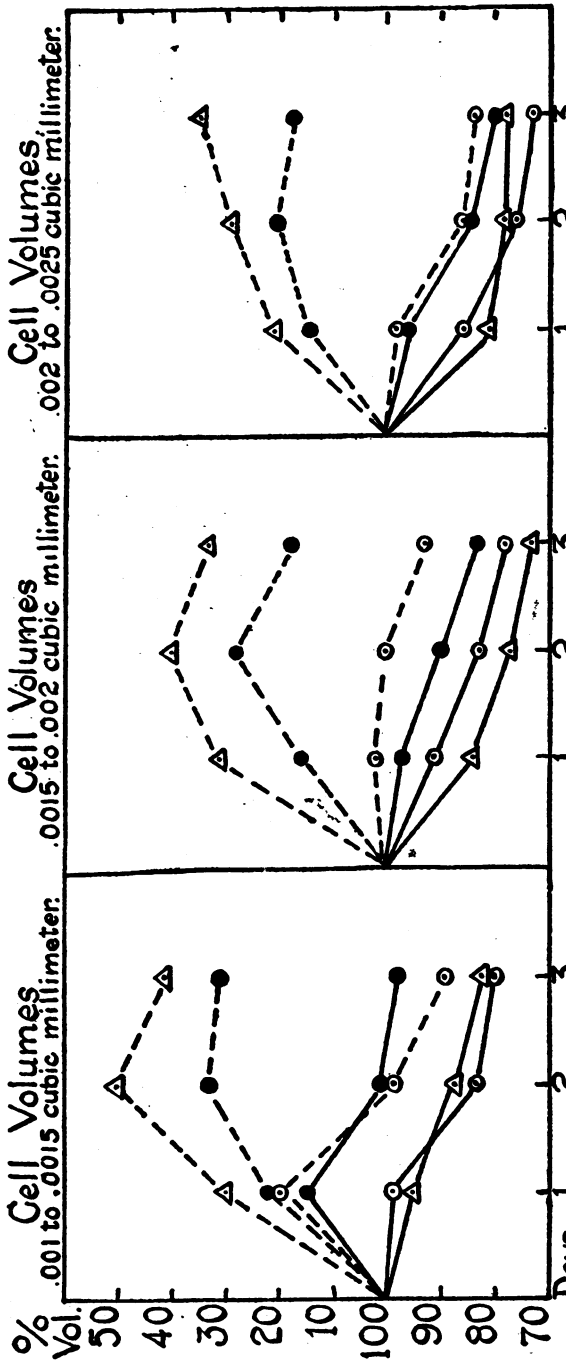

FIGURE 4.—Graph showing the per cent changes in cell and nuclear volumes of *Amoebae* of average cell volumes as indicated, when immersed in m/100,000 GSH, m/500,000,000 $CuCl_2$ and standard saline solution. Dotted lines, nuclear volume; solid lines, cell volume; solid symbols, changes in saline; open circular symbols, changes in $CuCl_2$; open triangles, changes in GSH

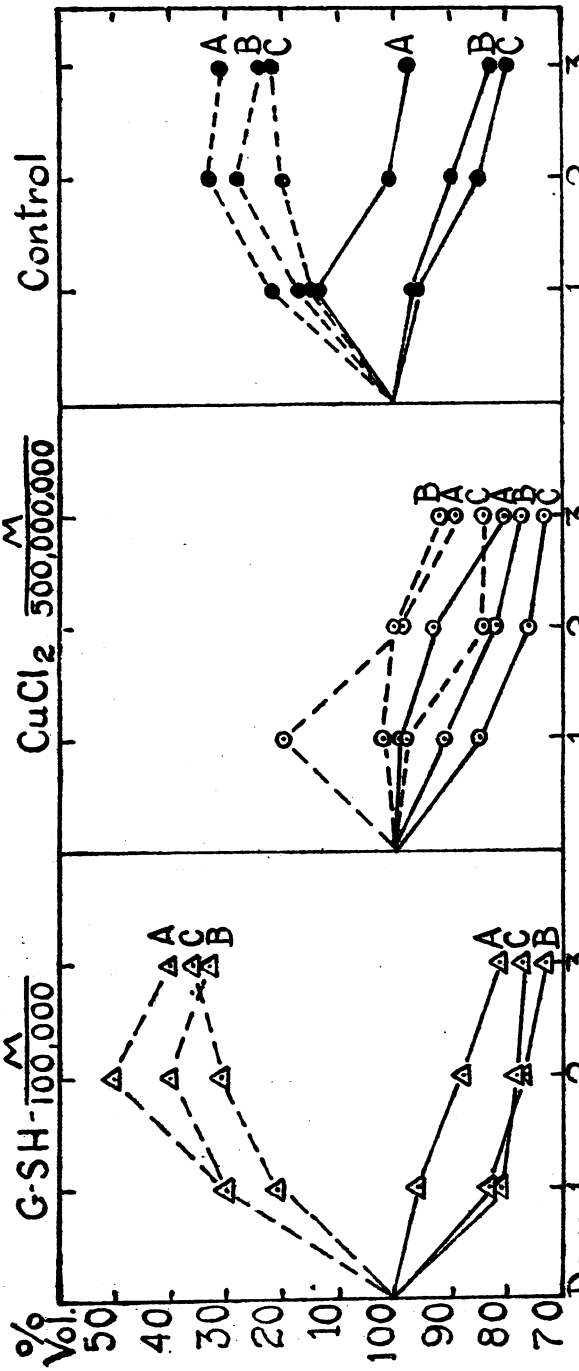

FIGURE 5.—Graph showing per cent changes in cell and nuclear volumes of *Amoebae* immersed in m/100,000 GSH, m/500,000,000 $CuCl_2$ and standard saline. Curves designated A, B, and C were obtained with *Amoebae* of average cell volumes of 0.001 to 0.0015, 0.0015 to 0.002, and 0.002 to 0.0025 cubic millimeter, respectively

group—i. e., on the first day for $CuCl_2$ and on the second day for the group in GSH and the controls—it will be seen that in all intervals the curves fall in order of original cell size, the highest per cent increase in nuclear volume being attained by the small cells and the lowest by the large cells, and that the highest percentage increase or least percentage decrease in cell volume is also similarly correlated.

Turning now to Figure 6 we see first, as found before by Voegtlin and Chalkley, the marked effect of GSH in raising the percentage of division and also the dependence of division on original cell size. As before, we note the apparent marked effect of GSH on nuclear division in cells of medium size—0.0015 to 0.002 cubic millimeter. In this particular series, however, it must be noted that this effect attains what is probably an abnormal emphasis, due to the fact that, in one experiment, cells from an exceptionally vigorous culture were used and no less than 90 per cent divided in GSH solution in the first 24 hours. This exceptional result influences mainly the curve for the medium-sized cells, and the irregularity so produced introduces some error due to the relatively small number of cells (as compared with the numbers used in Voegtlin and Chalkley's previous experiments). It is believed, however, that this apparent effect is real. Its explanation will be dealt with later.

$CuCl_2$, it is at once seen, markedly decreases the percentage of division. From the fact that only cells of large size divided, it is surmised that (as with GSH) the original cell size is the main controlling factor. In the controls, which, it will be noted, were twice as numerous as either experimental group, the dependence of division on cell size is also clearly brought out.

Figure 7 shows the percentage mortality in the three groups for each class interval of original cell volume. There is no significant difference between the control, $CuCl_2$ and GSH groups, except that it will be seen that the large cells in $CuCl_2$ show a markedly higher mortality as compared to any others. It is interesting to recall that the largest cells exposed to high concentrations of $CuCl_2$ or CuNa citrate (see fig. 1) were the first killed.

From Figure 8 it will be seen that the rate of the disappearance of food vacuoles is apparently influenced by both $CuCl_2$ and GSH, the first apparently exerting a retarding and the second an accelerating influence. While recognizing the fact that such disappearance might be due to mere ejection of undigested food, we do not believe this to be the method of disposal, but rather incline to view these curves as indicative of the effects of the reagents upon the digestive processes of the cell. This interpretation is consistent when its apparent relation to average cell size is compared with the same relation for cell growth. Thus it is apparent in the curves obtained from *Amoebae* in $CuCl_2$ that digestion—i. e., disappearance of food vacuoles—is quickest in the

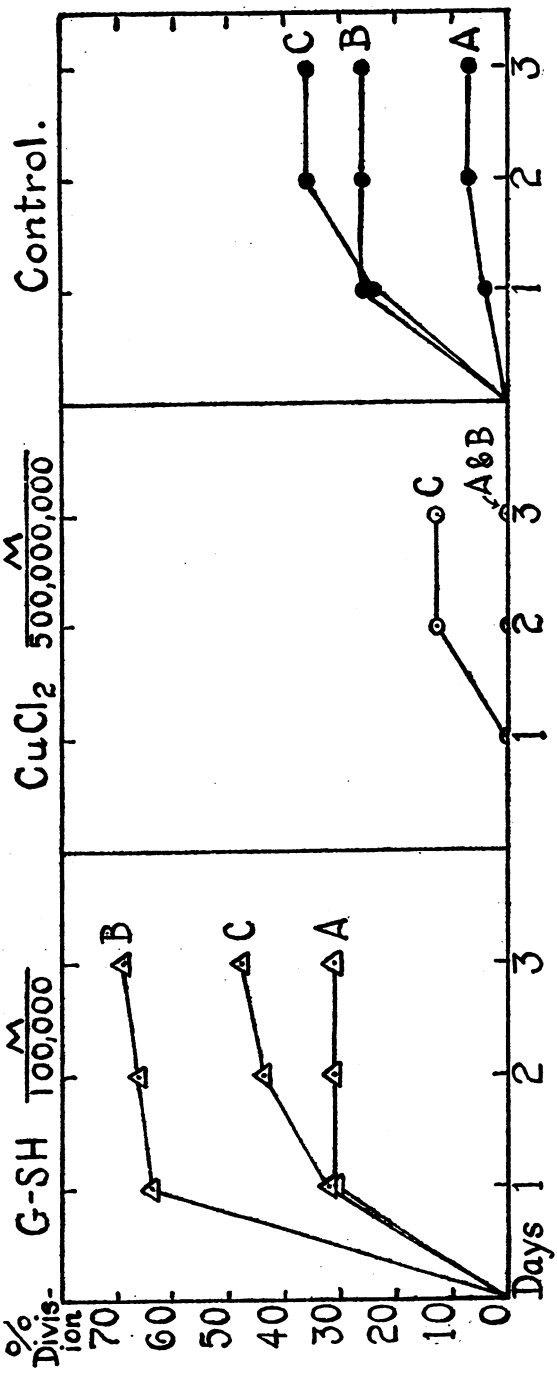

FIGURE 6.—Graph showing curves for per cent nuclear division in *Amoebae* immersed in m/100,000 GSH, m/500,000,000 $CuCl_2$ and standard saline, respectively. Curves designated A, B, and C were obtained with *Amoebae* of average cell volume of 0.001 to 0.0015, 0.0015 to 0.002, and 0.002 to 0.0025, respectively

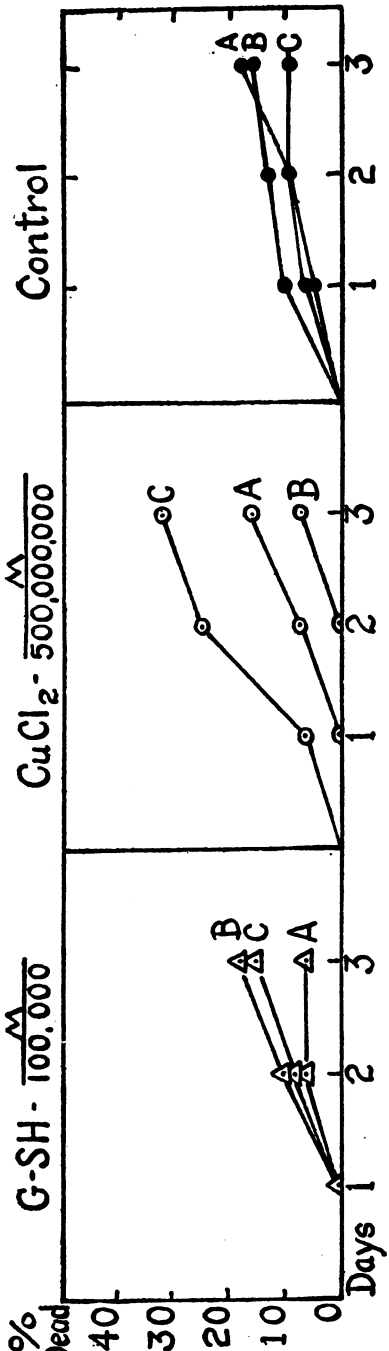

FIGURE 7.—Graph showing curves for per cent mortality in *Amoebae* immersed in m/100,000 GSH, m/500,000,000 $CuCl_2$, and standard saline solutions. Curves designated A, B, and C were obtained with *Amoebae* of average cell volumes of 0.001 to 0.0015, 0.0015 to 0.002, and 0.002 to 0.0025 cubic millimeter, respectively

small cells and slowest in the largest. Likewise, as has already been pointed out, resistance to the depressing effect of copper is greatest in the smallest and least in the largest cells—a perfectly consistent result if the resistance is considered to be dependent on the energy released by normal metabolic changes resulting from assimilation of food.

Summing up these results we find in the controls that, as a result of withdrawal of external food supply (survival conditions), cell growth is inhibited first, then nuclear growth. This effect is dependent on original cell size, the cells of least volume (youngest) being the least affected. Treatment of *Amoebae* with GSH enhances the growth of the nucleus apparently at the expense of the extra nuclear content of the cell. Treatment with $CuCl_2$ depresses all growth and apparently most markedly that of the nucleus. It also increases the rate of mortality of large cells, inhibits division, and probably decreases the rate at which food contained in food vacuoles is assimilated. Treatment with GSH has a contrary effect on growth and food assimilation. As to division, GSH increases the percentage of division in a given group of cells, exerting its major effect on those of *medium* size. All these effects are also functions of original cell size.

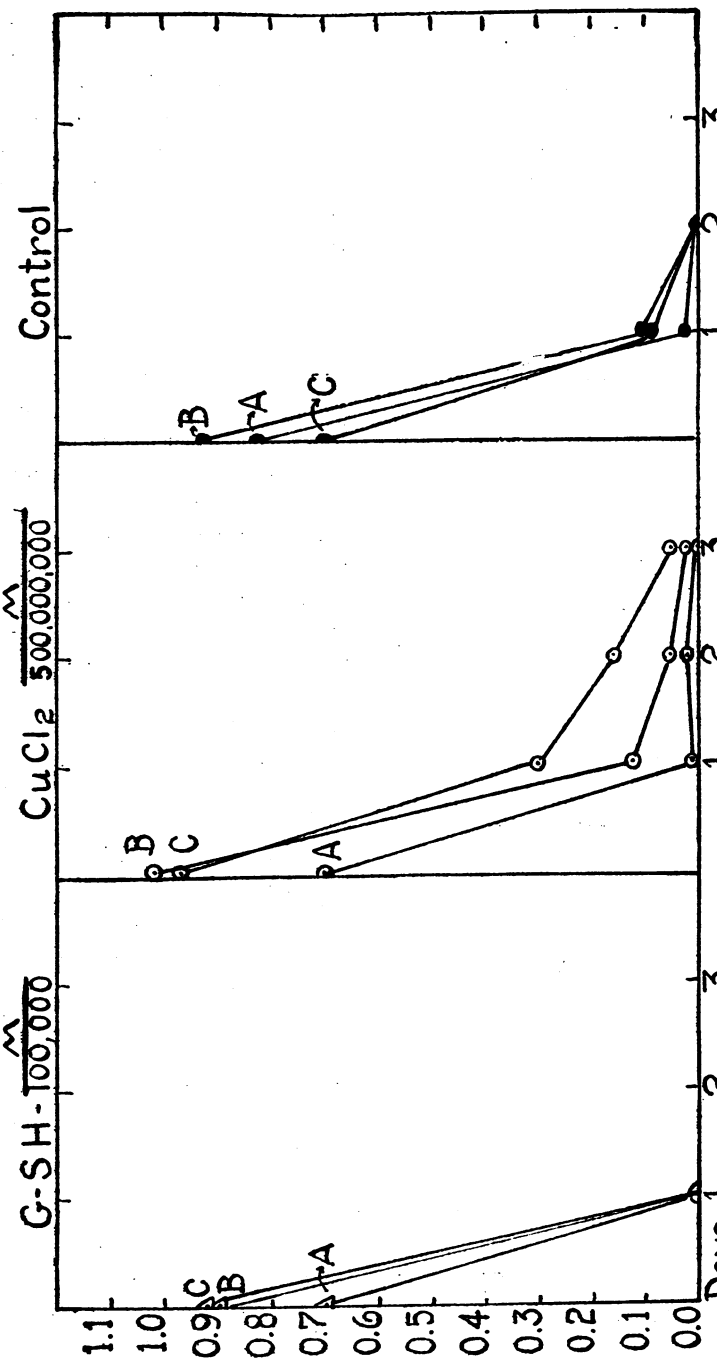

FIGURE 8.—Graph showing curves for number of food vacuoles per 0.0001 cubic millimeter of living protoplasm in *Amoebae* immersed in m/100,000 GSH, m/500,000,000 $CuCl_2$, and standard saline solutions. Curves designated A, B, and C were obtained with *Amoebae* having average cell volumes from 0.001 to 0.0015, 0.0015 to 0.002, and 0.002 to 0.0025, respectively.

We shall now consider the results of resumption of feeding after a period of starvation upon cells in saline and also upon cells treated with $CuCl_2$, as shown in Figure 9. It will be seen at once that the effect produced by the $CuCl_2$ is, to some extent at least, reversible. Cell volume, nuclear volume, and percentage of division all rise after feeding is resumed. However, it is to be noted that the rise in these activities is not as great as that which manifests itself in the controls upon resumption of feeding. Certain other differences are also manifest as between the $CuCl_2$-treated and the control organisms. The most marked immediate influence upon the controls is that exerted on the cell volume, while in the $CuCl_2$ cells the nucleus responds most rapidly, there being a distinct lag in the resumption of cell growth covering one day. Furthermore, it will be seen that in both groups division percentages are closely related to nuclear growth, but with a slight difference. In the controls and also in the $CuCl_2$ cells division occurs only on those days in which the mean nuclear volume increased, but in the $CuCl_2$ cells also only on those days after it exceeded its original volume—i. e., in the $CuCl_2$ group on the third day the mean nuclear volume increased—but there were no divisions until after it reached its original volume on the fourth. It is noticeable that there is for both the control and Cu-treated cells a distinct tendency toward the reestablishment of the original nucleo-cytoplasmic ratio as the result of this reestablishment of the old environmental conditions.

ANTAGONISM BETWEEN COPPER AND SH GLUTATHIONE

The preceding experiments clearly show the contrary action of GSH and $CuCl_2$ on *Amoeba*. It therefore seemed of interest to ascertain whether the action of $CuCl_2$ could be reversed by GSH.

In planning experiments to this end, certain modifications of the previous procedure were introduced. It was impracticable to use very low concentrations of $CuCl_2$ for long periods, as had hitherto been done. The effects of starvation during these extended periods would not be overcome by treatment with GSH [2] and would eclipse any action of GSH. After several preliminary tests, the following procedure was adopted:

Amoebae were exposed to relatively high concentrations of $CuCl_2$ for a short period until observation revealed a marked action of the salt, as indicated by rounding up of the cells and cessation of locomotion. Then a number of the cells thus treated were washed in standard saline, measured, and isolated into beakers. One-half of the number were placed in standard saline and one-half in a GSH solution equal in concentration to the $CuCl_2$ solution used. Two experiments were performed, one to test the effect of subsequent treatment with GSH on the toxic action of $CuCl_2$ and one to test its effect on division.

[2] The experiments of Voegtlin and Chalkley indicate that GSH is of negligible value as food.

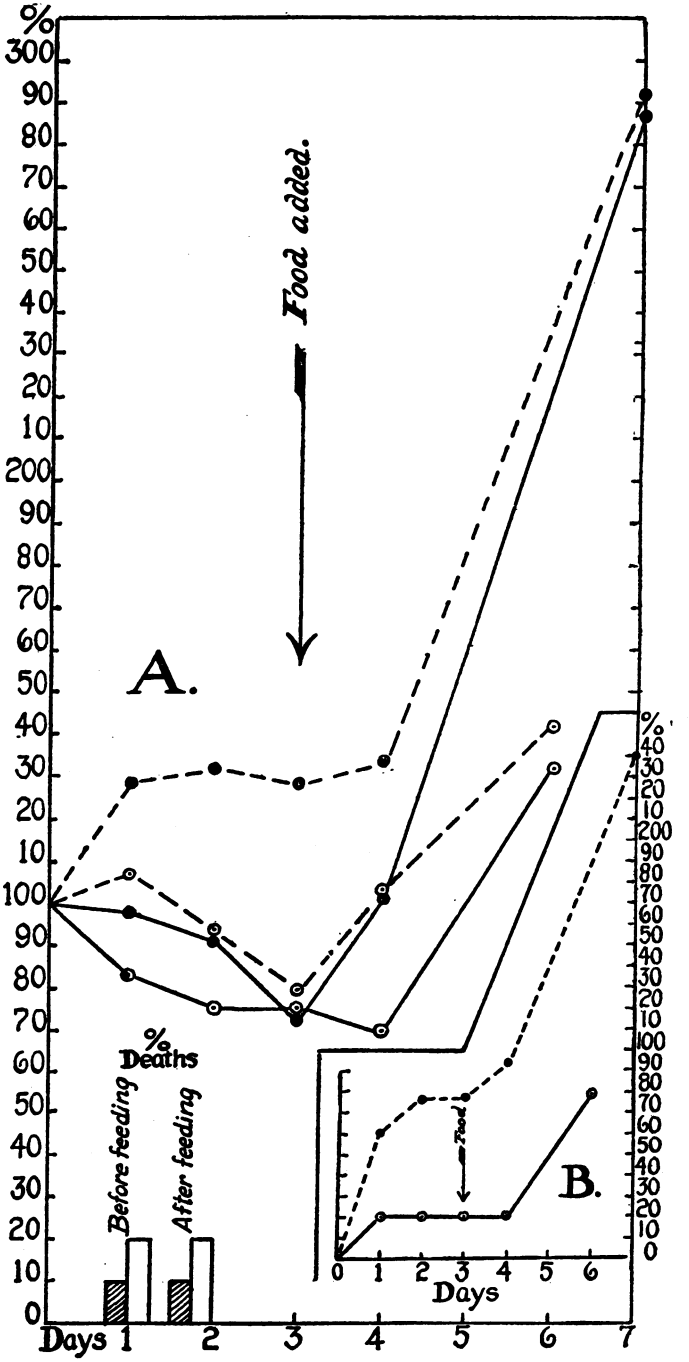

FIGURE 9.—Graph showing changes in per cent of cell and nuclear volumes, per cent of division and per cent mortality in *Amoebae* immersed under survival conditions for a period of three days in m/100,000,000 $CuCl_2$ solution and standard saline, respectively, and then all transferred to standard saline with food. A, volume changes; dotted line, nucleus; solid line, cell; solid symbols, $CuCl_2$; open symbols, saline; shaded column, saline; open column, $CuCl_2$. B, division; dotted line, saline; solid line $CuCl_2$

In the experiment on the effect of GSH on the toxic action of $CuCl_2$ three tests were made. In each test 40 *Amoebae* were used; These were all exposed to $CuCl_2$ solution m/25,000 for two hours. then, after washing, 20 were put into m/25,000 GSH and 20 into saline and all were left for 24 hours in these solutions. The results obtained are presented in Table 1.

TABLE 1.—*The reversal of the toxic action of copper by SH glutathione*

(All *Amoebae* treated with m/25,000 $CuCl_2$ for 2 hours, then transferred one-half to standard saline, one-half to GSH m/25,000 and left for 24 hours)

	Number of Amoebae	Dead	Living	Divided
TEST 1				
Saline	20	15	5	0
GSH	20	0	20	1
TEST 2				
Saline	20	18	2	0
GSH	20	1	19	1
TEST 3				
Saline	20	17	3	0
GSH	20	5	15	0

It is obvious that subsequent treatment of copper-poisoned *Amoebae* with GSH will prevent death and, if division is taken as an indication of normality, tend to the restoration of normal conditions.

In the experiment in regard to division, 40 *Amoebae* were used and two tests were made, 20 *Amoebae* being used in each. The procedure was as before, but the concentration of $CuCl_2$ and GSH was reduced to m/50,000 and measurements of the volumes of cell and nucleus were made as usual. In each test a control of 10 untreated *Amoebae* were put in standard saline alone and measured so as to provide a normal set of measurements of volume, per cent division, etc., for comparison. The results are presented in Figure 10.

From the figure it will be seen that the cells treated with $CuCl_2$ and transferred to saline exhibit decrease in volume of both cell and nucleus, high mortality, and no division. The controls give a set of curves similar to those previously obtained. The curves for the $CuCl_2$-treated cells that were transferred to GSH solution lie in an intermediate position. Attention is particularly directed to the curve showing the change in nuclear volume. It will be seen that the course of the curve indicates a growth that almost equals that for the controls in saline on the second day. The corresponding curve for $CuCl_2$-treated cells transferred to saline, however, at no time shows any indication of increase in volume. This again illustrates the stimulating effect of GSH upon the increase in volume of the nucleus in *Amoebae*.

DISCUSSION OF PRINCIPAL RESULTS

In this investigation new experimental facts have been discovered by the application of statistical methods. As in our previous work, definite conclusions are justifiable only if the behavior of a sufficiently large number of cells is considered, for the response of individual cells to a given set of conditions varies considerably. We also want to qualify at the outset the assumption that an increase in nuclear volume or total cell volume indicates normal growth under our experimental conditions. This we believe to be true for cells exposed to saline or dilute glutathione solutions not longer than two to three days, for the reason that during this time nuclear and cytoplasmic divisions occur, a fact which certainly shows that these cells are not under pathological conditions. However, this does not infer that the conditions are perfect, as about 10 to 15 per cent of the cells died during the course of the experiments, whether exposed to saline or glutathione.[3]

The first outstanding fact is the *growth of the nucleus under survival conditions in cells immersed in saline* and the *increased rate of nuclear growth in cells exposed to glutathione.* (Fig. 5.) Under both conditions the rate of nuclear growth is greatest in the small cells, less in the medium-sized cells, and least in the largest cells, thus indicating that *the rate of nuclear growth of the average cell decreases with age.* With the exception of the smallest cells in the controls (Group A, fig. 5) the nuclear growth is accompanied in all experiments by a decrease in total cell volume.[4] This decrease in cell volume (essentially of cytoplasm) over the whole period of the experiments is least pronounced in small cells and is more marked in the larger cells. This fact suggests that the nucleus grows at the expense of the cytoplasm—the immediate environment of the nucleus—just as the cell as a whole depends for its growth on the external environment.

The greater tendency of the smallest cells to increase in volume, both of nucleus and cytoplasm, conforms to the results of Chalkley (1931), which show that under normal *cultural conditions* the growth rate of *Amoebae* is most rapid in the young (small) cell and progressively decreases with age (increasing volume).

The general effect of exposure of *Amoebae* to very high dilutions of $CuCl_2$ (m/500,000,000) is a gradual decrease in both cell and nuclear volume. However, it appears (fig. 5) that nuclear growth proceeds

[3] The mortality in very dilute copper solution (m/500,000,000) was practically the same as in the other two solutions, with exception that the largest cells (Group C) showed an increase over the controls.

[4] The increase in cell volume on the first day in the cells of 0.001 to 0.0015 cubic millimeter volume does not appear attributable to a pathological effect consequent on transfer to saline from the culture, since the volume changes in such cells that were found dead on the third day show, on an average, an increase in volume the first day not materially different (12 per cent) from the average for all cells, but on the second their average volume drops sharply (23 to 77 per cent). This would surely indicate that decrease rather than increase of cell volume is associated with any pathological change that occurred. A further argument against the interpretation that this increase in cell volume in the small cells is due to pathological change is the fact that glutathione evoked from this class of cells the greatest per cent increase over controls in nuclear growth and division.

during the first day in cells of the smallest original cell volume. In a broad sense *copper inhibits nuclear growth, whereas glutathione increases it.* Furthermore, the inhibiting effect of copper on nuclear growth is overcome to some extent by glutathione. (Fig. 10.) There is, therefore, at least an indication of a partial antagonism of the two substances with regard to nuclear growth, in conformity with the clear-cut antagonism of glutathione on the toxic action of copper. Whether this antagonism is explained by the chemical affinity of copper for glutathione and other physiological SH compounds as is likely or whether other factors also enter into this problem can not be decided on the basis of the present evidence.

Having described the action of copper and glutathione on nuclear growth, it is desirable to discuss these data in relation to cell division as

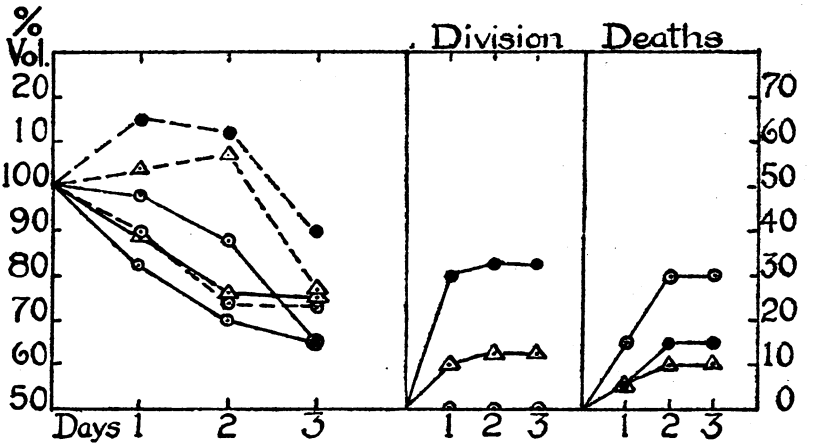

FIGURE 10.—Graph showing per cent change in average volume of cell and nucleus in *Amoebae* of average original cell volume of 0.0023 when immersed under survival conditions in standard saline, when immersed one and one-half hours under similar conditions in m/50,000 $CuCl_2$ solution, and transferred to (1) saline, (2) m/50,000 GSH solution; also the per cent division and per cent mortality for these three groups. Solid symbols, *Amoebae* in saline throughout; open circles, copper-treated *Amoebae* transferred to saline; open triangles, copper-treated *Amoebae* transferred to glutathione. In the graph for volume changes the dotted lines are curves for nuclear and the solid lines curves for cell volume changes

affected by glutathione or copper. Considering the data on nuclear growth (fig. 5) and those on cell division (fig. 6), it is obvious that taking the three classes of cells, irrespective of size—those in glutathione, those in copper solution, and the saline controls—the group showing the greatest rate of nuclear growth also shows the greatest per cent of division.

This at once suggests that nuclear division is a function of nuclear growth. However, it is evident that the nuclear growth rate is not the only controlling factor, for in all three solutions the smallest cells grow most rapidly and divide least. Voegtlin and Chalkley (1930)

showed that per cent division, under the conditions obtaining in these experiments, is a function of original cell volume. Chalkley (1931) found that nuclear volume is related to cell volume. It is desirable, therefore, to correlate original nuclear volume and per cent division for the cells in glutathione, saline, and copper solutions. Figure 11 (unbroken curves) definitely shows that the per cent division in all three solutions is a function of the original nuclear volume of the cells.

Glutathione, as we have just shown, stimulates the rate of growth of the nucleus, and the per cent of division is a function of the nuclear volume. The conclusion seems obvious that glutathione stimulates cells to division by stimulating nuclear growth and apparently by facilitating the transfer of material from cytoplasm to nucleus. It is quite evident, however, that this stimulation of nuclear growth by glutathione is only one factor in division, since it could result only in an increase in the rate of nuclear growth, and rate is not directly correlated with division. We therefore reconsidered the available data to determine if some of the other factors controlling division could not be ascertained.

Chalkley (1931) pointed out that nuclear division under *cultural* conditions normally occurs within a definite range of cell volume (0.0018 to 0.003 cubic millimeter, approximately), the average cell volume at which nuclear division occurs being 0.00275 cubic millimeter, approximately.

From his curve for the nucleo-cytoplasmic ratio it is possible to calculate the nuclear volume for a cell with a volume of 0.00275 cubic millimeter. This is 0.0000203 cubic millimeter nuclear volume, or the optimum nuclear volume for division. Since Chalkley has shown that cell division is less likely to occur if a cell volume of 0.00275 cubic millimeter is exceeded, it is probable that if the corresponding nuclear volume (0.00002 cubic millimeter) is exceeded, nuclear division is also less likely to occur.

We therefore applied these considerations holding true for cultural conditions to the data obtained in the present investigation under survival conditions. We assume then that 0.00002 cubic millimeter is the optimum nuclear volume for nuclear division. Inasmuch as the nuclear volumes of divided cells at the exact time of division was not observed, these volumes were approximated by taking for each cell the mean between the nuclear volume at the observation preceding division and the sum of the nuclear volumes of the daughter cells at the first observation (less than 24 hours) after division. The averages of these means were for the 27 cells that divided in saline 0.0000205 and for the 25 in glutathione 0.0000181. For the two divided cells in the copper solution it was 0.0000196. The difference in these values is not statistically significant. Now, as set forth

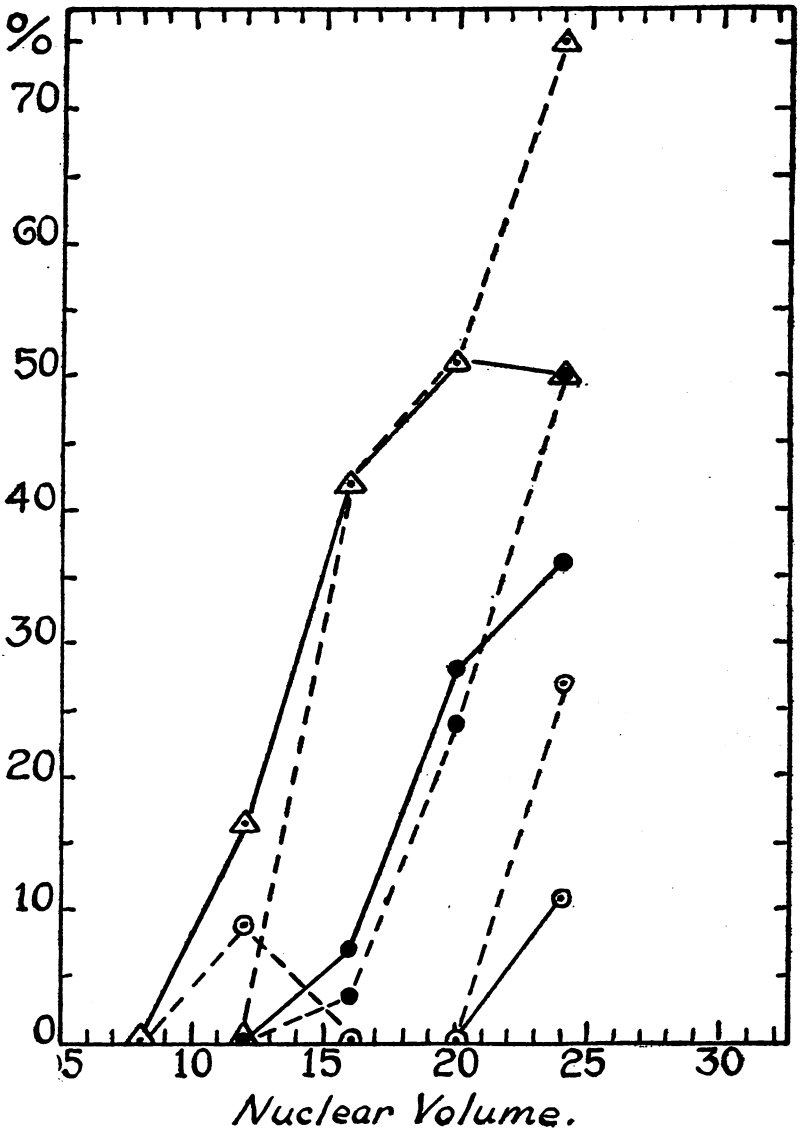

FIGURE 11.—Graph showing the relation between (A) the percentage of nuclear division on the first day and the average original nuclear volume (unbroken lines); (B) the percentage of *Amoebae* that attained a nuclear volume equal to or in excess of 25.7 arbitrary units=0.00002 cubic millimeter on the first day and the average original nuclear volume (broken lines). Open triangles, *Amoebae* in m/100,000 GSH; solid symbols, *Amoebae* in saline; open circles, *Amoebae* in m/500,000,000 $CuCl_2$. (NOTE.—The number of *Amoebae* observed was as follows: Nuclear volume 10 to 14; saline 21; GSH 6; $CuCl_2$ 12. Nuclear volume 14 to 18; saline 28; GSH 15.5; $CuCl_2$ 16. Nuclear volume 18 to 22; saline 25; GSH 16.5; $CuCl_2$ 13.5. Nuclear volume 22 to 26; saline 36; GSH 12; $CuCl_2$ 13.5)

above, this value of 0.00002 was considered to be the nuclear volume at which the probability of nuclear division is maximal. If this is true, two further relations should hold: First, the distribution of the volumes of the nuclei that divided should be distributed closely about this value, and, second, the percentage of division that occurred on the first day, as cells of larger and larger original nuclear volume were employed in these experiments, should be (whether the solution employed was GSH, Cu, or control) closely related to the percentage of the cells in each class that on that day grew to a nuclear volume exceeding 0.0002 cubic millimeter. However, such a correlation should not hold beyond a point where a large majority of the cells exceeded this value, for the nuclei of a fair proportion of such cells would necessarily considerably exceed the optimum nuclear volume and be therefore less likely to divide. The test lay in (*a*) plotting the distribution of the divided cells according to their nuclear volume at division, (*b*) plotting the percentage distribution of the cells of different nuclear volumes that exceeded the volume of 0.00002 cubic millimeter, and comparing this with the curve similarly obtained for the percentage of division in the same cells. The resulting curves are given in Figure 12 and in the curves shown in broken line in Figure 11. It is plain that the prediction holds.

If we now consider the action of glutathione and copper upon division in *Amoeba* under survival conditions we must give due weight to the following factors: (1) The influence of the age of any cell as expressed in rate of nuclear growth, and (2) the apparently definite average optimum nuclear volume at which nuclear division is most probable. These two factors, it appears, are intrinsic characteristics of all *Amoebae* and therefore determining factors in the action of glutathione and copper upon *Amoeba*. Realizing this, we can conclude as follows: Glutathione stimulates nuclear division by stimulating nuclear growth. It does this probably by facilitating transfer of cytoplasmic material to the nucleus. This transfer of material for nuclear growth is not produced *de novo* by glutathione, as it apparently also takes place, though to a lesser extent, in cells not exposed to glutathione. There is no indication at present that glutathione can evoke nuclear division at a smaller mean nuclear volume than the optimum nuclear volume at which controls divide—i. e., glutathione does not stimulate division of "immature" cells. Copper, in infinitesimal amounts, depresses nuclear growth and division. Here, again, the maturity of the cell appears as conditioning the degree of depression, and the mean nuclear volume at division is probably the same as in the controls. The depressing effect of copper in certain concentrations on nuclear growth is to some extent antagonized by subsequent exposure to glutathione.

It might be noted that these effects, concerned as they evidently are with rates of growth, suggest that the effect of both glutathione and copper may possibly be linked with the action of intracellular enzymes. The recent work of Waldschmidt-Leitz and Grassmann and his collaborators on the effect of glutathione and copper on proteolytic enzymes of the cathepsin type appears very suggestive in

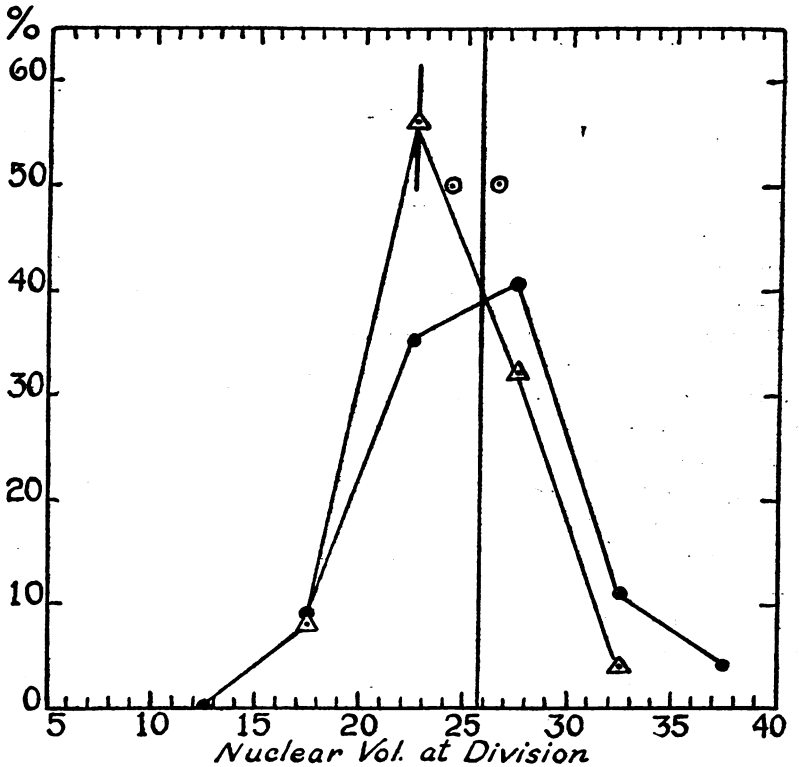

FIGURE 12.—Graph showing the distribution as to volume of nucleus at division in the cells that divided in saline, m/100,000 GSH, and m/500,000,000 $CuCl_2$. Open triangles, cells in glutathione; solid circles, cells in saline; open circles, cells in $CuCl_2$. The full vertical line shows the optimum nuclear volume for division and coincides with the mean volume at division for the nuclei of the cells in saline. The short vertical line indicates the mean nuclear volume for the cells in glutathione. Twenty-five cells divided in the glutathione and twenty-seven in the saline solution; only two in the $CuCl_2$ solution. The points for the $CuCl_2$ cells indicate the actual nuclear volumes of these two cells at division

this respect. They found that SH glutathione activates cathepsin and copper inhibits this enzyme. It is interesting that the molar concentrations of glutathione for activation are far higher than the molar copper concentrations, which are necessary for inhibition of proteolysis. A similar quantitative difference between effective concentrations of glutathione and copper exists with respect to the action of these two substances on nuclear growth and division in *Amoeba*.

As a more general conclusion it may be stated that the work with glutathione and copper has demonstrated the possibility of controlling cell division by chemical means. It is important to continue the search for other active chemical agents which influence cell division in very high dilution.

SUMMARY

1. In *Amoebae* deprived of food (under survival conditions) and immersed in saline, the nucleus, on an average, continues to increase in volume for approximately 48 hours. The cell, except in small cells 0.001 to 0.0015 cubic millimeter in volume, steadily decreases in volume from the time of immersion. In the cells from 0.001 to 0.0015 cubic millimeter the cell grows in volume for 24 hours and then decreases in volume. The increase in nuclear and decrease in cell volumes are inverse and direct functions, respectively, of the cell volume at the time of immersion. The per cent nuclear division in a given group of such *Amoebae* is a direct function of the original cell or nuclear volume, over the range of volumes used (0.001 to 0.0025 cubic millimeter for the cell and 0.000008 to 0.00002 cubic millimeter for the nucleus).

2. If a solution of m/100,000 glutathione in saline is used instead of simple saline the per cent rate of increase in volume of the nucleus is increased over that in saline. The rate of decrease in cell volume is also greater, likewise the percent of division occurring, and apparently the rate of digestion of material in food vacuoles.

3. If a solution of m/500,000,000 copper in saline is used instead of simple saline, the increase in volume of the nucleus is replaced by a decrease in volume. The rate of decrease in cell volume is increased in respect to *Amoebae* in saline. The rate of digestion is apparently decreased.

4. All effects of glutathione or copper are functions of original average cell or nuclear volume at immersion.

5. In all solutions the average nuclear volume at division is (within the limit of error) the same and is approximately 0.00002 cubic millimeter.

6. In all solutions the percentage of division in a given group during the first 24 hours varies directly as the percentage (of that group) in which the nuclei attain a volume of 0.00002 cubic millimeter during that period, except for groups having an original nuclear volume of 0.000016 cubic millimeter or over.

It is concluded that the increase of per cent division in *Amoebae* by glutathione and probably its inhibition by copper results from the effect of the reagents upon the nuclear volume.

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SUMMARY OF CERTAIN NOTIFIABLE DISEASES IN THE UNITED STATES, 1930[1]

There is presented herewith a summary of the reported prevalence of certain of the important communicable diseases in the United States during the calendar year 1930. The rates have been computed from data furnished by the health officers of the several States, the District of Columbia, and insular possessions. Morbidity and mortality data for the year were received from all States (including the District of Columbia), except that mortality figures were not received from Colorado.

The populations used in computing case and death rates were estimated as of July 1, 1930, based on the 1920 and 1930 census figures.

The estimated expectancy given for some of the diseases represents an attempt to ascertain from the experience of recent years how many cases of the disease under consideration might be expected in 1930.

In comparing the figures for 1930 with the estimated expectancy, or with the figures for preceding years, it should be borne in mind that there has been a gradual improvement in the reporting of communicable diseases during the last few years. An increase in the number of cases reported may be due to better reporting of the particular disease rather than to an increase in the number of cases occurring.

[1] It has been found impossible to publish the detailed information by disease and States at the present time. This information has been compiled and prepared for the printer, however, and it is hoped that it will be possible to publish it at some future date. It is expected to issue it as a supplement to the PUBLIC HEALTH REPORTS, as similar tabulations have been issued annually since 1912.

SUMMARY

CHICKEN POX

48 States: [1]	
Cases reported, 1930 (population, 123,191,519)	228, 354
Estimated expectancy, based on years 1923–1929	192, 372
Cases per 1,000 inhabitants, 1930	1. 854
Cases per 1,000 inhabitants, estimated expectancy	1. 651
46 States: [1]	
Cases reported, 1930 (population, 120,138,216)	218, 786
Cases per 1,000 inhabitants, 1930	1. 821
Deaths registered, 1930	120
Deaths per 1,000 inhabitants, 1930	0. 001
Cases reported for each death registered, 1930	1, 823

DIPHTHERIA

48 States: [1]	
Cases reported, 1930 (population, 123,191,519)	66, 576
Estimated expectancy, based on years 1923–1929	99, 918
Cases per 1,000 inhabitants, 1930	0. 540
Cases per 1,000 inhabitants, estimated expectancy	0. 857
47 States: [1]	
Cases reported, 1930 (population, 122,153,383)	66, 106
Cases per 1,000 inhabitants, 1930	0. 541
Deaths registered, 1930	5, 971
Deaths per 1,000 inhabitants, 1930	0. 049
Cases reported for each death registered, 1930	11

GONORRHEA

41 States: [1]	
Cases reported, 1930 (population, 115,811,882)	158, 054
Cases per 1,000 inhabitants, 1930	1. 365

INFLUENZA

31 States: [1]	
Cases reported, 1930 (population, 67,136,455)	101, 765
Cases per 1,000 inhabitants, 1930	1. 516
47 States: [1]	
Deaths registered, 1930 (population, 122,153,383)	22, 898
Deaths per 1,000 inhabitants, 1930	0. 187
30 States: [1]	
Cases reported, 1930 (population, 66,098,319)	101, 745
Cases per 1,000 inhabitants, 1930	1. 539
Deaths registered, 1930	13, 475
Deaths per 1,000 inhabitants, 1930	0. 204
Cases reported for each death registered, 1930	8

LETHARGIC ENCEPHALITIS

43 States.[1]	
Deaths registered, 1930 (population 120,912,050)	1, 094
Deaths per 1,000 inhabitants, 1930	0. 009

[1] The District of Columbia is also included.

MALARIA

32 States:	
Cases reported, 1930 (population 97,323,832)	98,482
Cases per 1,000 inhabitants, 1930	1.012
36 States:	
Deaths registered, 1930 (population 115,455,724)	3,426
Deaths per 1,000 inhabitants, 1930	0.030
31 States:	
Cases reported, 1930 (population 96,285,696)	98,481
Cases, per 1,000 inhabitants, 1930	1.023
Deaths registered, 1930	3,316
Deaths per 1,000 inhabitants, 1930	0.034
Cases reported for each death registered, 1930	30

MEASLES

48 States:[1]	
Cases reported, 1930 (population 123,191,519)	419,465
Estimated expectancy, based on years 1923–1929	381,012
Cases per 1,000 inhabitants, 1930	3.405
Cases per 1,000 inhabitants, estimated expectancy	3.270
47 States:[1]	
Cases reported, 1930 (population 122,153,383)	407,153
Cases per 1,000 inhabitants, 1930	3.333
Deaths registered, 1930	3,433
Deaths per 1,000 inhabitants, 1930	0.028
Cases reported for each death registered, 1930	119

MENINGOCOCCUS MENINGITIS

44 States:[1]	
Cases reported, 1930 (population 120,387,037)	8,384
Estimated expectancy, based on years 1923–1929	3,031
Cases per 1,000 inhabitants, 1930	0.070
Cases per 1,000 inhabitants, estimated expectancy	0.027
47 States:[1]	
Deaths registered, 1930 (population 122,153,383)	3,747
Deaths per 1,000 inhabitants, 1930	0.031
43 States:[1]	
Cases reported, 1930 (population 119,348,901)	8,299
Cases per 1,000 inhabitants, 1930	0.070
Deaths registered, 1930	3,657
Deaths per 1,000 inhabitants, 1930	0.031
Cases reported for each death registered, 1930	2

MUMPS

43 States:[2]	
Cases reported, 1930 (population 108,726,790)	124,259
Estimated expectancy, based on years 1923–1929	95,334
Cases per 1,000 inhabitants, 1930	1.143
Cases per 1,000 inhabitants, estimated expectancy	0.927
43 States:[2]	
Deaths registered, 1930 (population 112,304,683)	79
Deaths per 1,000 inhabitants, 1930	0.001

[1] The District of Columbia is also included. [2] Not the same groups of States for cases and deaths.

41 States:	
Cases reported, 1930 (population 105,673,487)	115, 704
Cases per 1,000 inhabitants, 1930	1. 095
Deaths registered, 1930	72
Deaths per 1,000 inhabitants, 1930	0. 001
Cases reported for each death registered, 1930	1, 607

PELLAGRA

17 States:[1]	
Cases reported, 1930 (population 48,261,552)	24, 747
Cases per 1,000 inhabitants, 1930	0. 513
41 States:[1]	
Deaths registered, 1930 (population 120,004,052)	7, 138
Deaths per 1,000 inhabitants, 1930	0. 059

PNEUMONIA (ALL FORMS)

46 States:[1]	
Deaths registered, 1930 (population 117,894,080)	97, 960
Deaths per 1,000 inhabitants, 1930	0. 831

POLIOMYELITIS (INFANTILE PARALYSIS)

45 States:[1]	
Cases reported, 1930 (population 116,182,887)	9, 188
Estimated expectancy, based on years 1923–1929	3, 707
Cases per 1,000 inhabitants, 1930	0. 079
Cases per 1,000 inhabitants, estimated expectancy	0. 034
47 States:[1]	
Deaths registered, 1930 (population 122,153, 383)	1, 395
Deaths per 1,000 inhabitants, 1930	0. 011
44 States:[1]	
Cases reported, 1930 (population 115,144,751)	9, 112
Cases per 1,000 inhabitants, 1930	0. 079
Deaths registered, 1930	1, 321
Deaths per 1,000 inhabitants, 1930	0. 011
Cases reported for each death registered, 1930	7

SCARLET FEVER

48 States:[1]	
Cases reported, 1930 (population 123,191,519)	174, 221
Estimated expectancy, based on years 1923–1929	177, 828
Cases per 1,000 inhabitants, 1930	1. 414
Cases per 1,000 inhabitants, estimated expectancy	1. 526
47 States:[1]	
Cases reported, 1930 (population 122,153,383)	173, 102
Cases per 1,000 inhabitants, 1930	1. 417
Deaths registered, 1930	2, 215
Deaths per 1,000 inhabitants, 1930	0. 018
Cases reported for each death registered, 1930	78

SEPTIC SORE THROAT

28 States:	
Cases reported, 1930 (population 68,824,667)	3, 577
Cases per 1,000 inhabitants, 1930	0. 052

[1] The District of Columbia is also included.

39 States: [1]	
Deaths registered, 1930 (population 101,260,067)	1,205
Deaths per 1,000 inhabitants, 1930	0.012

SMALLPOX

48 States: [1]	
Cases reported, 1930 (population 123,191,519)	48,907
Estimated expectancy, based on years 1923–1929	31,944
Cases per 1,000 inhabitants, 1930	0.397
Cases per 1,000 inhabitants, estimated expectancy	0.274
47 States: [1]	
Cases reported, 1930 (population 122,153,383)	48,329
Cases per 1,000 inhabitants, 1930	0.396
Deaths registered, 1930	170
Deaths per 1,000 inhabitants, 1930	0.001
Cases reported for each death registered, 1930	284

SYPHILIS

41 States: [1]	
Cases reported, 1930 (population 115,811,882)	221,735
Cases per 1,000 inhabitants, 1930	1.915

TUBERCULOSIS (ALL FORMS)

46 States: [1]	
Deaths registered, 1930 (population 121,715,337)	83,523
Deaths per 1,000 inhabitants, 1930	0.686

TUBERCULOSIS (RESPIRATORY SYSTEM)

42 States: [1]	
Deaths registered, 1930 (population 114,460,377)	72,158
Deaths per 1,000 inhabitants, 1930	0.630

TYPHOID FEVER

48 States: [1]	
Cases reported, 1930 (population 123,191,519)	27,201
Estimated expectancy, based on years 1923–1929	32,312
Cases per 1,000 inhabitants, 1930	0.221
Cases per 1,000 inhabitants, estimated expectancy	0.277
47 States: [1]	
Cases reported, 1930 (population 122,153,383)	26,978
Cases per 1,000 inhabitants, 1930	0.221
Deaths registered, 1930	6,072
Deaths per 1,000 inhabitants, 1930	0.050
Cases reported for each death registered, 1930	4

WHOOPING COUGH

48 States: [1]	
Cases reported, 1930 (population 123,191,519)	166,914
Estimated expectancy, based on years 1923–1929	167,154
Cases per 1,000 inhabitants, 1930	1.355
Cases per 1,000 inhabitants, estimated expectancy	1.434
47 States: [1]	
Cases reported, 1930 (population 122,153,383)	164,375
Cases per 1,000 inhabitants, 1930	1.346
Deaths registered, 1930	5,455
Deaths per 1,000 inhabitants, 1930	0.045
Cases reported for each death registered, 1930	30

[1] The District of Columbia is also included.

COURT DECISION RELATING TO PUBLIC HEALTH

Revocation by board of health of milk permit.—(New York Supreme Court, Appellate Division; Henry Morris, Inc., *v.* Department of Health of City of New York et al., 254 N. Y. S. 90; decided Dec. 18, 1931.) A mandamus proceeding was brought to require the department of health and the board of health of New York City to rescind the revocation of the petitioner's permit to conduct a wholesale and retail milk business and to reinstate the permit. One of the defenses was that a certain named person, who was alleged to bear a bad reputation in the milk business, had been found to be in charge of petitioner's milk depot after the petitioner had been notified that such person's active connection with it must cease. The court held that this defense was sufficient in law "for, if proved, the action of respondents could not be held to be arbitrary, tyrannical, or unreasonable."

Another defense was that, after petitioner's milk permit had been revoked, it had reapplied for a permit; that such permit was issued, as the person to whom objection was made had ceased to be connected with the petitioner; and that petitioner held such permit until it transferred its business to a successor or affiliated corporation to which the permit was issued. This defense was also held to be sufficient in law, the court saying:

> No order of peremptory mandamus can issue to require respondents to do what they have already done, viz, issue a permit to petitioner. That these averments set forth facts which have arisen since defendants denied petitioner's earlier application for a permit will not prevent their consideration upon the trial. Consequently, their inclusion in the return was proper. There is no rule requiring that the only facts in a return upon which a defense can be based must have occurred at or before the time when the officer or board, whose decision is sought to be reviewed, acted. * * *

DEATHS DURING WEEK ENDED FEBRUARY 13, 1932

Summary of information received by telegraph from industrial insurance companies for the week ended February 13, 1932, and corresponding week of 1931. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

	Week ended Feb. 13, 1932	Corresponding week, 1931
Policies in force	74, 068, 315	75, 151, 201
Number of death claims	11, 487	15, 397
Death claims per 1,000 policies in force, annual rate	8. 1	10. 7
Death claims per 1,000 policies, first 6 weeks of year, annual rate	9. 7	11. 1

Deaths [1] from all causes in certain large cities of the United States during the week ended February 13, 1932, infant mortality, annual death rate, and comparison with corresponding week of 1931. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

[The rates furnished in this summary are based upon mid-year population estimates derived from the 1930 census]

City	Week ended Feb. 13, 1932				Corresponding week, 1931		Death rate [2] for the first 6 weeks	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year	1932	1931
Total (83 cities)	8,275	11.9	648	[4] 54	14.0	903	12.0	14.3
Akron	41	8.1	5	62	8.5	5	7.8	8.6
Albany [5]	26	10.4	2	41	22.6	3	15.1	16.0
Atlanta [6]	69	12.7	13	127	14.1	8	15.5	15.5
White	36	10.0	9	133	11.6	4	12.0	13.3
Colored	33	18.0	4	115	19.0	4	22.4	19.9
Baltimore [5 6]	205	13.1	23	81	19.5	18	13.8	18.2
White	157	12.2	14	64	18.0	13	12.9	16.8
Colored	48	16.7	9	145	26.3	5	17.6	24.4
Birmingham [6]	66	12.5	6	63	12.0	4	12.3	14.5
White	35	10.7	4	66	9.4	2	9.9	10.8
Colored	31	15.4	2	54	16.3	2	16.1	20.4
Boston	222	14.7	15	45	20.3	25	14.9	17.8
Bridgeport	29	10.3	3	53	11.3	3	11.4	14.2
Buffalo	138	12.3	12	58	15.8	18	13.0	14.8
Cambridge	34	15.5	4	83	18.7	1	13.9	14.6
Camden	31	13.6	3	53	16.7	3	14.5	18.3
Canton	14	6.8	2	50	13.2	3	9.7	11.1
Chicago [5]	815	12.1	72	71	13.0	66	10.8	12.7
Cincinnati	155	17.5	8	51	16.6	9	16.3	18.2
Cleveland	192	10.9	19	62	13.2	25	10.8	11.5
Columbus	84	14.7	4	40	14.3	6	15.3	14.2
Dallas [6]	61	11.3	8	-------	13.0	10	11.3	12.9
White	43	9.6	6	-------	12.0	7	10.5	11.7
Colored	18	19.3	2	-------	17.6	3	15.2	18.7
Dayton	67	14.7	4	57	11.3	5	11.0	11.7
Denver	80	14.2	5	49	15.4	5	17.1	15.9
Des Moines	47	16.8	0	0	13.4	4	12.0	12.6
Detroit	280	8.5	29	52	11.6	50	8.3	9.2
Duluth	24	12.3	0	0	7.2	3	10.0	11.5
El Paso	25	12.2	4	-------	14.9	3	15.6	20.0
Erie	37	16.2	1	21	14.6	3	10.9	11.5
Fall River [5 7]	32	14.5	1	27	16.3	7	12.7	13.3
Flint	28	8.6	7	103	4.8	3	8.1	7.2
Fort Worth [6]	28	8.6	4	-------	8.4	1	11.0	11.8
White	25	9.1	4	-------	6.7	1	10.0	11.0
Colored	3	5.9	0	-------	17.3	0	16.3	16.0
Grand Rapids	32	9.6	1	17	8.8	2	8.0	10.0
Houston [6]	70	11.3	10	-------	12.3	4	10.6	12.1
White	54	11.8	8	-------	9.4	3	9.8	10.8
Colored	16	9.8	2	-------	20.1	1	12.7	15.5
Indianapolis [6]	95	13.3	5	41	16.5	9	13.4	14.8
White	78	12.4	3	28	14.9	8	12.8	14.2
Colored	17	19.3	2	137	27.7	1	17.6	19.2
Jersey City	66	10.8	11	91	13.9	13	11.0	15.1
Kansas City, Kans. [6]	33	13.9	3	66	16.1	5	13.7	16.4
White	23	12.0	1	27	16.8	5	13.0	15.2
Colored	10	22.1	2	256	13.3	0	16.9	21.4
Kansas City, Mo	108	13.6	9	102	16.6	12	12.4	14.9
Knoxville [6]	18	8.4	6	152	12.4	5	11.4	14.6
White	15	8.4	5	140	9.7	4	10.7	13.2
Colored	3	8.6	1	270	26.4	1	15.2	21.5
Long Beach	24	7.8	0	0	12.7	1	10.9	11.0
Los Angeles	298	11.3	13	39	10.2	25	12.5	12.5
Louisville [6]	77	13.0	5	46	14.4	13	14.7	18.0
White	64	12.8	4	42	13.4	10	13.1	16.1
Colored	13	14.2	1	75	19.7	3	23.3	28.6
Lowell [7]	29	15.1	3	78	14.0	4	15.4	15.3
Lynn	21	10.7	2	57	10.7	1	11.1	13.5
Memphis [6]	105	20.8	9	98	9.5	5	17.5	16.4
White	52	16.7	4	68	7.5	2	13.5	14.2
Colored	53	27.5	5	151	12.7	3	24.0	19.9
Miami [6]	29	13.3	1	28	15.8	1	13.8	13.5
White	22	13.0	0	0	17.3	1	13.3	13.6
Colored	7	14.5	1	101	10.3	0	15.5	13.4
Milwaukee	116	10.1	6	29	12.8	19	9.2	10.8

See footnotes at end of table.

Deaths [1] from all causes in certain large cities of the United States during the week ended February 13, 1932, infant mortality, annual death rate, and comparison with corresponding week of 1931—Continued

City	Week ended Feb. 13, 1932				Corresponding week, 1931		Death rate [2] for the first 6 weeks	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year	1932	1931
Minneapolis	113	12.3	6	39	12.9	11	9.9	12.5
Nashville [4]	42	14.0	3	45	15.1	6	13.6	16.7
White	29	13.3	3	59	13.0	2	13.1	14.7
Colored	13	15.8	0	0	20.7	4	14.8	21.9
New Bedford [7]	34	15.8	2	58	17.1	2	12.5	13.7
New Haven	45	14.5	1	20	11.9	2	13.0	13.3
New Orleans [6]	140	15.4	13	74	20.2	15	15.7	21.0
White	80	12.4	5	44	15.5	8	13.0	17.5
Colored	60	22.8	8	131	31.7	7	22.5	29.4
New York	1,370	9.9	90	40	12.6	152	10.6	14.8
Bronx Borough	172	6.5	7	20	9.0	22	8.1	10.7
Brooklyn Borough	469	9.2	36	40	12.1	62	9.6	14.0
Manhattan Borough	547	16.1	41	59	18.8	61	16.4	22.0
Queens Borough	144	6.2	5	21	8.4	15	6.8	10.1
Richmond Borough	38	11.9	1	20	12.1	2	13.3	14.6
Newark, N. J	90	10.5	6	33	15.7	14	10.6	15.0
Oakland	65	11.4	4	50	8.2	4	12.0	11.7
Oklahoma City	44	11.2	3	41	10.9	7	10.2	11.6
Omaha	85	20.3	9	102	14.2	4	14.9	14.6
Paterson	26	9.8	0	0	15.0	4	13.0	16.2
Peoria	25	11.8	1	28	15.9	2	11.8	15.6
Philadelphia	444	11.7	25	39	16.0	57	12.5	17.4
Pittsburgh	182	14.0	25	114	20.2	40	13.7	17.4
Portland, Oreg	72	12.1	5	64	11.7	5	12.7	13.1
Providence	76	15.5	10	97	17.4	7	14.9	16.1
Richmond [6]	69	19.5	6	90	17.0	6	15.8	18.2
White	42	16.6	2	45	14.3	3	13.5	14.8
Colored	27	26.7	4	183	23.7	3	21.6	26.6
Rochester	70	10.9	3	29	15.2	8	11.7	13.5
St. Louis	192	12.1	8	29	24.1	39	14.2	18.5
St. Paul	62	11.6	2	21	9.6	5	10.1	10.6
Salt Lake City [5]	31	11.2	2	31	10.2	1	11.9	12.4
San Antonio	54	11.4	8	----	13.0	11	14.0	15.8
San Diego	42	13.4	1	22	13.7	2	17.1	16.6
San Francisco	189	14.9	9	62	11.6	9	14.8	14.1
Schenectady	22	11.9	2	58	9.8	1	11.7	11.1
Seattle	84	11.7	6	60	11.1	5	11.9	12.5
Somerville	22	10.8	1	40	14.4	3	9.8	11.7
South Bend	18	8.5	1	29	10.6	5	8.8	7.7
Spokane	21	9.4	1	27	10.3	3	12.7	13.0
Springfield, Mass	43	14.6	4	67	15.4	3	13.2	14.1
Syracuse	39	9.4	3	39	13.7	10	12.1	13.4
Tacoma	28	13.5	1	28	13.1	4	12.2	13.8
Tampa [6]	20	9.7	3	86	16.4	3	11.9	16.4
White	11	6.8	2	70	15.1	2	11.0	14.9
Colored	9	20.6	1	158	21.1	1	14.9	21.9
Toledo	78	13.6	8	87	14.4	5	12.4	12.8
Trenton	42	17.7	4	79	17.7	5	15.4	19.2
Utica	29	14.7	1	28	14.3	1	16.6	16.5
Washington, D. C. [6]	173	18.3	24	135	18.8	7	16.2	19.0
White	111	16.2	15	123	17.9	2	14.4	16.8
Colored	62	23.7	9	160	21.2	5	21.0	24.8
Waterbury	21	10.8	3	99	12.4	2	9.9	11.4
Wilmington, Del. [7]	24	11.8	2	45	26.9	2	13.7	17.8
Worcester	45	11.8	2	28	15.1	1	12.5	16.4
Yonkers	17	6.3	0	0	10.1	6	7.2	11.7
Youngstown	36	10.7	2	32	11.8	4	10.1	11.0

[1] Deaths of nonresidents are included. Stillbirths are excluded.
[2] These rates represent annual rates per 1,000 population, as estimated for 1932 and 1931 by the arithmetical method.
[3] Deaths under 1 year of age per 1,000 estimated live births. Cities left blank are not in the registration area for births.
[4] Data for 78 cities.
[5] Deaths for week ended Friday.
[6] For the cities for which deaths are shown by color, the percentages of colored population in 1930 were as follows: Atlanta, 33; Baltimore, 18; Birmingham, 38; Dallas, 17; Fort Worth, 16; Houston, 27; Indianapolis, 12; Kansas City, Kans., 19; Knoxville, 16; Louisville, 15; Memphis, 38; Miami, 23; Nashville, 28. New Orleans, 29; Richmond, 29; Tampa, 21; and Washington, D. C., 27.
[7] Population Apr. 1, 1930; decreased 1920 to 1930, no estimate made.

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

Reports for Weeks Ended February 20, 1932, and February 21, 1931

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 20, 1932, and February 21, 1931

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931
New England States:								
Maine	6	2	40	105	589	23	0	0
New Hampshire	2				9	42	0	0
Vermont				4	45	9	0	0
Massachusetts	63	56	18	130	427	579	2	3
Rhode Island	2	2		6	686	1	0	0
Connecticut	9	12	21	105	278	414	2	1
Middle Atlantid States:								
New York	132	115	[1] 158	[1] 180	1,969	983	10	18
New Jersey	49	65	56	123	161	815	1	1
Pennsylvania	106	94			1,405	2,254	2	13
East North Central States:								
Ohio	33	27	22	95	267	184	0	4
Indiana	48	34	122	74	87	699	4	7
Illinois	120	124	164	273	228	1,291	12	9
Michigan	56	37	61	269	294	137	0	4
Wisconsin	18	21	301	152	274	260	1	1
West North Central States:								
Minnesota	8	14	3	7	25	40	1	1
Iowa	9	7	4		7		1	4
Missouri	32	37	19	206	21	873	2	8
North Dakota	1	13			54	16	0	0
South Dakota	2	10	228	2	81	15	0	0
Nebraksa	6	12	269	2	65	1	3	2
Kansas	21	20	17	107	70	15	11	3
South Atlantic States:								
Delaware	2	2	6	41	2	27	0	0
Maryland [2]	25	31	28	702	32	480	5	2
District of Columbia	20	4	2	12	3	84	0	2
Virginia							1	
West Virginia	26	11	96	166	396	66	1	2
North Carolina	28	31	52	395	243	466	1	6
South Carolina	12	13	564	4,191	49	164	0	4
Georgia [3]	14	6	121	1,596	7	88	3	2
Florida [3]	11	7	2	133	9	190	0	1
East South Central States:								
Kentucky	48	12	226	31	103	150	3	10
Tennessee	35	3	169	416	64	96	5	2
Alabama [3]	23	41	92	350	2	497	0	7
Mississippi	11	16					2	5

[1] New York City only.
[2] Week ended Friday.
[3] Typhus fever, week ended Feb. 20, 1932, 21 cases; 5 cases in Georgia, 1 case in Florida, 1 case in Alabama, and 14 cases in Texas.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 20, 1932, and February 21, 1931—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931
West South Central States:								
Arkansas	9	8	65	208	3	15	0	1
Louisiana	32	71	10	159	6	-------	1	3
Oklahoma [4]	15	22	945	28	12	34	0	0
Texas [3]	42	32	148	70	44	161	2	0
Mountain States:								
Montana	-------	1	1,708	-------	102	5	2	1
Idaho	1	-------	3	-------	-------	1	1	1
Wyming	-------	-------	-------	6	1	3	0	1
Colorado	10	7	-------	-------	61	133	1	2
New Mexico	21	5	27	3	106	48	0	2
Arizona	6	5	68	10	-------	222	0	4
Utah [3]	2	-------	-------	10	-------	2	0	2
Pacific States:								
Washington	1	5	-------	-------	480	50	1	0
Oregon	8	15	257	26	104	78	0	0
California	45	53	303	513	315	996	8	6

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931
New England States:								
Maine	0	0	38	40	0	0	2	1
New Hampshire	0	0	28	3	0	0	0	0
Vermont	0	0	7	1	3	1	0	0
Massachusetts	1	0	543	399	0	0	4	4
Rhode Island	0	0	49	24	0	0	0	4
Connecticut	0	0	112	55	2	0	1	1
Middle Atlantic States:								
New York	5	3	1,421	836	2	13	10	7
New Jersey	0	0	279	299	0	0	2	2
Pennsylvania	1	1	613	646	0	0	13	25
East North Central States:								
Ohio	2	1	281	293	34	54	3	6
Indiana	0	0	101	346	17	108	1	1
Illinois	3	0	419	465	1	52	4	2
Michigan	2	0	489	463	3	26	13	5
Wisconsin	0	0	92	143	0	7	3	2
West North Central States:								
Minnesota	0	0	120	97	1	6	0	2
Iowa	1	0	44	167	24	62	1	1
Missouri	0	0	83	328	12	45	1	2
North Dakota	0	0	45	41	3	2	1	1
South Dakota	0	0	3	15	9	36	1	1
Nebraska	0	1	21	51	8	44	0	1
Kansas	0	0	50	80	5	116	0	3
South Atlantic States:								
Delaware	0	0	12	30	0	0	1	0
Maryland [3]	0	0	113	97	0	0	4	1
District of Columbia	0	0	27	14	0	0	0	1
Virginia	1	-------	-------	-------	-------	-------	-------	-------
West Virginia	0	0	51	27	0	18	3	2
North Carolina	2	0	29	65	5	2	3	2
South Carolina	0	1	6	22	0	5	3	0
Georgia [3]	0	0	14	72	0	0	4	0
Florida [3]	1	0	14	10	0	0	13	3
East South Central States:								
Kentucky	2	0	56	104	7	8	13	0
Tennessee	1	0	50	45	8	6	11	2
Alabama [3]	1	3	16	35	5	12	5	15
Mississippi	0	0	14	24	37	9	7	4

[2] Week ended Friday.

[3] Typhus fever, week ended Feb. 20, 1932, 21 cases; 5 cases in Georgia, 1 case in Florida, 1 case in Alabama, and 14 cases in Texas.

[4] Figures for 1932 are exclusive of Oklahoma City and Tulsa, and for 1931 are exclusive of Tulsa only.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 20, 1932, and February 21, 1931—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931	Week ended Feb. 20, 1932	Week ended Feb. 21, 1931
West South Central States:								
Arkansas	0	1	10	24	37	18	0	6
Louisiana	1	2	19	26	3	21	28	8
Oklahoma [4]	0	1	10	26	1	79	1	2
Texas [3]	0	0	44	18	26	28	4	4
Mountain States:								
Montana	0	0	54	62	2	6	1	1
Idaho	0	0	2	11	4	0	1	4
Wyoming	1	0	3	22	0	4	0	0
Colorado	1	0	40	43	2	6	1	2
New Mexico	0	0	8	9	1	7	1	2
Arizona	0	0	11	4	0	2	0	1
Utah [3]	0	0	5	21	0	0	0	0
Pacific States:								
Washington	0	0	37	57	15	22	0	4
Oregon	0	2	25	20	16	20	1	0
California	3	6	132	122	17	68	5	10

[3] Week ended Friday.
[3] Typhus fever, week ended Feb. 20, 1932, 21 cases, 5 cases in Georgia, 1 case in Florida, 1 case in Alabama, and 14 cases in Texas.
[4] Figures for 1932 are exclusive of Oklahoma City and Tulsa, and for 1931 are exclusive of Tulsa only.

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	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January, 1932										
Florida	----	67	13	23	36	7	1	19	2	24
Idaho	4	13	36	----	11	----	0	66	35	2
Indiana	61	361	172	----	555	----	6	575	84	20
Maine	4	25	710	----	2,805	----	5	172	0	8
Maryland	5	176	137	----	69	----	1	440	0	24
Massachusetts	4	259	104	----	1,603	----	6	2,027	40	19
Minnesota	4	84	8	----	180	----	3	443	22	7
New Jersey	10	147	69	----	381	----	3	893	0	15
Ohio	6	454	145	2	1,333	----	4	1,976	150	38
Porto Rico	----	54	115	5,105	97	1	2	----	0	5

January, 1932	Cases
Chicken pox:	
Florida	16
Idaho	60
Indiana	739
Maine	261
Maryland	478
Massachusetts	1,269
Minnesota	444
New Jersey	1,256
Ohio	1,708
Porto Rico	16
Conjunctivitis:	
Maine	3
Diarrhea:	
Maryland	14
Diarrhea and enteritis:	
Ohio (under two years)	22
Dysentery:	
Florida	1
Maryland	2
Dysentery—Continued.	Cases
Massachusetts	3
Minnesota (amebic)	2
New Jersey	1
Porto Rico	31
Filariasis:	
Porto Rico	34
Food poisoning:	
Ohio	1
German measles:	
Maine	91
Maryland	14
Massachusetts	58
New Jersey	53
Ohio	15
Impetigo contagiosa:	
Maryland	32
Lead poisoning:	
Massachusetts	3
New Jersey	1
Ohio	14

Lethargic encephalitis:	Cases
Maryland	3
Massachusetts	2
New Jersey	5
Ohio	3
Mumps:	
Florida	26
Idaho	42
Indiana	341
Maine	60
Maryland	315
Massachusetts	1,314
New Jersey	341
Ohio	1,114
Porto Rico	26
Ophthalmia neonatorum:	
Maryland	2
Massachusetts	128
Ohio	74
Porto Rico	7
Paratyphoid fever:	
Maine	1
Ohio	2
Porto Rico	1
Puerperal septicemia:	
Ohio	7
Porto Rico	6
Rabies in animals:	
Maryland	2
Rabies in man:	
New Jersey	1
Scabies:	
Maryland	5
Septic sore throat:	
Maryland	7
Massachusetts	27
Ohio	135
Tetanus:	
Maryland	3
Massachusetts	1
New Jersey	1
Porto Rico	9

Tetanus, infantile:	Cases
Porto Rico	11
Trachoma:	
Massachusetts	5
New Jersey	5
Ohio	5
Porto Rico	8
Trench mouth:	
Indiana	1
Trichinosis:	
Maryland	1
Ohio	11
Tularaemia:	
Indiana	9
Maryland	6
Ohio	18
Typhus fever:	
Maryland	2
Undulant fever:	
Indiana	1
Maryland	7
Minnesota	2
New Jersey	4
Ohio	7
Vincent's angina:	
Maine	3
Maryland	23
Whooping cough:	
Florida	27
Idaho	14
Indiana	335
Maine	130
Maryland	789
Massachusetts	910
Minnesota	111
New Jersey	1,214
Ohio	2,259
Porto Rico	195
Yaws:	
Porto Rico	2

RECIPROCAL NOTIFICATIONS

Notifications regarding communicable diseases sent during the month of January, 1932, by departments of health of States named to other State health departments

Disease	California	Illinois	Massachusetts	Minnesota	New York
Diphtheria			1		1
Measles					1
Poliomyelitis				1	1
Scarlet fever			1		
Trachoma					1
Tuberculosis	3	1		12	
Undulant fever				1	

INFLUENZA—JANUARY 17 TO FEBRUARY 20, 1932

In the table following are presented the case rates per 100,000 population, annual basis, by geographic groups, of the weekly reports of influenza cases for the five weeks ended February 20, 1932, compared with similar rates for the week ended February 21, 1931. The rates are calculated, in groups, on the reported cases and estimated populations of the following groups of States: New England—Maine, Massachusetts, and Connecticut; Middle Atlantic—New Jersey and

New York City; East North Central—Ohio, Indiana, Illinois, Michigan, and Wisconsin; West North Central—Minnesota, Missouri, South Dakota, Nebraska, and Kansas; South Atlantic—Delaware, Maryland, District of Columbia, West Virginia, North Carolina, South Carolina, Georgia, and Florida; East South Central—Kentucky, Tennessee, and Alabama; West South Central—Arkansas, Louisiana, Oklahoma (exclusive of Oklahoma City and Tulsa), and Texas; Mountain—Montana, Idaho, Wyoming, New Mexico, and Arizona; Pacific—Oregon and California. Complete figures are not available for the States which are omitted from the table.

Influenza case rates per 100,000 population

	Week ended—					
	Jan. 23, 1932	Jan. 30, 1932	Feb. 6, 1932	Feb. 13, 1932	Feb. 20, 1932	Feb. 21, 1931
35 States	104	138	263	306	345	604
New England States	163	386	71	41	61	264
Middle Atlantic States	18	25	53	54	98	141
East North Central States	21	40	39	95	136	176
West North Central States	6	36	83	[1] 154	274	166
South Atlantic States	251	272	286	327	335	2,795
East South Central States	90	98	287	469	319	524
West South Central States	68	97	239	431	506	302
Mountain States	757	759	5,271	3,651	4,509	48
Pacific States	230	261	342	523	422	412

[1] Estimated.

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 96 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 33,377,000. The estimated population of the 89 cities reporting deaths is more than 31,818,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended February 13, 1932, and February 14, 1931

	1932	1931	Estimated expectancy
Cases reported			
Diphtheria:			
46 States	1,360	1,111	----
96 cities	506	411	804
Measles:			
45 States	9,515	11,386	----
96 cities	2,761	3,337	----
Meningococcus meningitis:			
46 States	69	142	----
96 cities	34	75	----
Poliomyelitis:			
46 States	32	30	----
Scarlet fever:			
46 States	5,774	5,843	----
96 cities	2,496	2,230	1,557
Smallpox:			
46 States	302	937	----
96 cities	26	116	52
Typhoid fever:			
46 States	210	122	----
96 cities	40	19	27
Deaths reported			
Influenza and pneumonia:			
89 cities	923	1,685	----
Smallpox:			
89 cities	0	0	----

City reports for week ended February 13, 1932

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded, and the estimated expectancy is the mean number of cases reported for the week during non-epidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1923 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviation from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND								
Maine:								
Portland	3	0	1	----	0	226	1	4
New Hampshire:								
Concord	0	0	1	----	0	0	0	1
Nashua	0	0	0	----	0	0	0	0
Vermont:								
Barre	----	0	----	----	----	----	----	----
Burlington	0	1	0	----	0	16	1	0
Massachusetts:								
Boston	62	29	12	2	2	20	19	28
Fall River	4	4	2	1	1	10	1	0
Springfield	13	4	0	----	0	7	7	0
Worcester	2	4	6	----	0	3	38	2
Rhode Island:								
Pawtucket	0	1	0	----	0	0	0	0
Providence	22	8	4	----	0	569	6	5
Connecticut:								
Bridgeport	4	5	0	2	2	0	0	3
Hartford	4	5	1	----	0	2	18	3
New Haven	16	1	0	2	2	1	10	3
MIDDLE ATLANTIC								
New York:								
Buffalo	42	11	7	----	1	20	3	12
New York	234	186	124	81	17	44	117	165
Rochester	3	5	4	1	0	196	18	5
Syracuse	15	2	0	----	0	95	16	3
New Jersey:								
Camden	9	6	4	----	1	2	0	3
Newark	55	13	7	7	2	4	42	6
Trenton	7	3	0	1	1	2	6	3
Pennsylvania:								
Philadelphia	140	64	14	5	5	5	44	42
Pittsburgh	58	18	9	6	2	203	48	36
Reading	21	2	0	----	0	0	3	5
EAST NORTH CENTRAL								
Ohio:								
Cincinnati	4	7	4	1	1	0	0	13
Cleveland	109	33	15	21	2	247	101	19
Columbus	8	2	9	5	5	0	0	10
Toledo	26	4	1	4	1	13	0	8
Indiana:								
Fort Wayne	3	3	5	----	1	1	0	1
Indianapolis	35	7	2	----	0	3	86	10
South Bend	5	1	0	----	2	0	0	0
Terre Haute	11	1	0	----	0	0	0	4
Illinois:								
Chicago	89	93	57	50	12	126	11	74
Springfield	3	1	1	1	0	0	8	2
Michigan:								
Detroit	99	44	26	9	1	24	29	31
Flint	12	2	1	1	0	25	41	7
Grand Rapids	9	0	0	----	1	66	11	1
Wisconsin:								
Kenosha	8	1	0	----	0	0	0	0
Madison	4	0	1	----	0	1	1	1
Milwaukee	61	14	4	1	0	105	32	9
Racine	20	1	0	----	0	13	78	0
Superior	0	0	0	----	0	1	44	0

City reports for week ended February 13, 1932—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
WEST NORTH CENTRAL								
Minnesota:								
Duluth	7	0	0	----	0	0	0	4
Minneapolis	18	14	4	----	5	4	26	20
St. Paul	15	4	0	2	2	0	2	7
Iowa:								
Davenport	1	0	0	----	----	0	3	----
Des Moines	0	1	1	----	----	0	0	----
Sioux City	3	0	4	----	----	0	0	----
Waterloo	8	0	0	----	----	2	0	----
Missouri:								
Kansas City	21	5	1	----	0	5	1	11
St. Joseph	12	1	6	----	0	0	1	2
St. Louis	33	38	23	2	2	1	2	10
North Dakota:								
Fargo	1	0	0	----	0	38	1	0
Grand Forks	0	1	0	----	----	0	0	----
South Dakota:								
Aberdeen	4	0	0	----	----	46	0	----
Nebraska:								
Omaha	8	6	6	----	0	0	3	23
Kansas:								
Topeka	22	1	2	----	0	0	2	1
Wichita	36	2	1	----	0	46	0	6
SOUTH ATLANTIC								
Delaware:								
Wilmington	2	2	0	----	0	0	3	2
Maryland:								
Baltimore	174	22	8	5	2	2	113	26
Cumberland	1	0	0	----	0	0	0	1
Frederick	0	0	2	----	0	0	0	0
District of Columbia:								
Washington	33	17	6	3	2	5	0	26
Virginia:								
Lynchburg	3	1	2	----	0	0	0	2
Norfolk	2	1	1	----	0	0	0	1
Richmond	6	4	4	----	3	0	0	5
Roanoke	2	1	2	----	0	0	0	0
West Virginia:								
Charleston	13	0	0	----	0	82	0	1
Huntington	1	----	0	----	0	2	0	0
Wheeling	2	1	0	----	0	0	0	5
North Carolina:								
Raleigh	0	0	0	----	0	34	0	0
Wilmington	0	0	0	----	0	0	0	0
Winston-Salem	8	1	0	----	0	1	4	6
South Carolina:								
Charleston	0	0	0	44	0	0	0	0
Columbia	4	1	0	----	0	0	0	1
Georgia:								
Atlanta	1	3	5	12	2	1	0	12
Brunswick	0	0	0	----	0	0	0	0
Savannah	2	1	1	12	0	0	0	2
Florida:								
Miami	0	2	3	----	0	1	0	0
Tampa	2	1	0	----	0	0	0	0
EAST SOUTH CENTRAL								
Kentucky:								
Covington	0	1	0	----	0	0	0	3
Lexington	0	----	3	2	0	0	5	2
Tennessee:								
Memphis	5	3	5	----	2	3	0	10
Nashville	1	1	4	----	0	0	0	6
Alabama:								
Birmingham	1	3	1	2	5	0	2	9
Mobile	0	1	4	----	0	0	1	1
Montgomery	3	1	1	----	----	0	3	----

City reports for week ended February 13, 1932—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
WEST SOUTH CENTRAL								
Arkansas:								
Fort Smith	2	1	0		0	0	0	0
Little Rock	0	0	1		1	0	29	4
Louisiana:								
New Orleans	1	15	19	2	3	0	0	12
Shreveport	5	0	1		0	50	3	2
Oklahoma: Muskogee	0		2	7		0	4	
Texas:								
Dallas	4	6	5	7	4	43	0	8
Fort Worth	16	5	2		0	0	0	4
Galveston	0	1	0		0	0	0	2
Houston	2	7	22		0	4	0	6
San Antonio	0	4	3		5	0	0	2
MOUNTAIN								
Montana:								
Billings	6	0	0		0	0	0	0
Great Falls	1	1	0		0	1	0	0
Helena	0	0	0		0	14	0	0
Missoula	0	0	1		0	0	0	0
Idaho: Boise	0	0	1		0	0	1	3
Colorado:								
Denver	9	8	9		4	8	16	13
Pueblo	21	1	1		0	0	0	1
New Mexico: Albuquerque	5	0	2		0	1	1	2
Arizona: Phoenix	0		1		0	1	0	3
Utah: Salt Lake City	16	2	0		3	0	0	2
Nevada: Reno	0	0	0		0	0	0	1
PACIFIC								
Washington:								
Seattle	31	4	1			375	5	
Spokane	27	1	0			10	0	
Tacoma	0	1	0		0	10	3	2
Oregon:								
Portland	19	6	1	11	1	6	5	5
Salem	0	0	0	28		0	0	
California:								
Los Angeles	161	34	27	177	1	2	7	30
Sacramento	33	1	3		1	0	3	15
San Francisco		13						

City reports for week ended February 13, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	4	0	0	0	0	1	0	0	0	1	32
New Hampshire:											
Concord	0	5	0	0	0	0	0	0	0	0	10
Nashua	1	0	0	0	0	0	0	0	0	0	0
Vermont:											
Barre	0	----	0	----	----	----	0	----	----	----	----
Burlington	1	0	0	6	0	0	0	0	0	0	11
Massachusetts:											
Boston	95	164	0	0	0	11	1	1	0	24	222
Fall River	4	2	0	0	0	3	0	0	0	4	32
Springfield	10	12	0	0	0	2	0	0	0	10	41
Worcester	11	30	0	0	0	2	0	0	0	7	45
Rhode Island:											
Pawtucket	3	0	0	0	0	0	0	0	0	0	13
Providence	15	24	0	0	0	4	0	0	0	4	76
Connecticut:											
Bridgeport	11	5	0	1	0	0	0	0	0	2	29
Hartford	7	6	0	0	0	0	0	0	0	25	32
New Haven	7	15	0	0	0	0	0	0	0	18	45
MIDDLE ATLANTIC											
New York:											
Buffalo	29	93	0	1	0	9	0	0	0	26	134
New York	280	700	0	0	0	64	6	3	0	153	1,370
Rochester	10	76	0	0	0	1	0	0	0	2	64
Syracuse	12	27	0	0	0	0	0	0	0	45	39
New Jersey:											
Camden	6	34	0	0	0	0	0	1	0	6	31
Newark	35	26	0	0	0	7	0	0	0	47	9
Trenton	8	5	0	0	0	7	1	0	0	2	42
Pennsylvania:											
Philadelphia	105	189	0	0	0	30	2	0	0	303	444
Pittsburgh	33	74	0	0	0	12	1	3	1	45	182
Reading	5	11	0	0	0	0	0	0	0	16	30
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	25	46	0	0	0	8	1	0	0	8	155
Cleveland	52	68	0	0	0	10	1	0	0	180	192
Columbus	12	16	0	0	0	2	0	0	0	26	84
Toledo	14	5	2	0	0	6	0	0	0	51	78
Indiana:											
Fort Wayne	5	4	0	0	0	0	0	0	0	2	29
Indianapolis	15	3	6	1	0	1	1	1	0	42	----
South Bend	5	0	0	0	0	1	0	0	0	2	18
Terre Haute	1	0	1	0	0	1	0	0	0	1	25
Illinois:											
Chicago	143	230	2	0	0	46	2	1	0	192	815
Springfield	3	4	0	0	0	0	0	0	0	6	21
Michigan:											
Detroit	121	203	2	0	0	27	1	1	0	153	280
Flint	16	10	1	0	0	1	0	0	0	4	28
Grand Rapids	14	8	1	0	0	1	0	0	0	2	32
Wisconsin:											
Kenosha	1	2	0	0	0	0	0	0	0	2	8
Madison	4	4	0	0	0	2	0	3	0	8	24
Milwaukee	36	51	1	0	0	6	0	0	0	159	116
Racine	5	2	0	0	0	0	0	0	0	0	13
Superior	3	0	0	0	0	0	0	0	0	0	4

City reports for week ended February 13, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL											
Minnesota:											
Duluth	10	1	0	0	0	0	0	0	0	3	24
Minneapolis	43	50	0	0	0	0	0	4	0	9	113
St. Paul	28	16	0	0	0	3	1	0	0	10	66
Iowa:											
Davenport	1	9	2	0	-------	-------	0	0	-------	0	-------
Des Moines	7	10	2	1	-------	-------	0	0	-------	0	47
Sioux City	2	5	0	5	-------	-------	0	0	-------	2	-------
Waterloo	2	0	0	0	-------	-------	0	0	-------	1	-------
Missouri:											
Kansas City	21	11	0	0	0	9	1	0	0	133	108
St. Joseph	3	4	0	8	0	2	0	0	0	0	34
St. Louis	48	22	2	1	0	4	0	1	0	96	192
North Dakota:											
Fargo	3	2	0	0	0	0	0	0	0	2	5
Grand Forks	1	1	1	0	-------	-------	0	0	-------	0	-------
South Dakota:											
Aberdeen	0	1	0	0	-------	-------	0	0	-------	6	-------
Nebraska:											
Omaha	7	8	2	0	0	2	0	0	0	2	85
Kansas:											
Topeka	2	1	0	0	0	0	0	0	0	24	15
Wichita	5	4	0	0	0	3	0	0	0	5	36
SOUTH ATLANTIC											
Delaware:											
Wilmington	6	9	0	0	0	0	0	0	0	7	24
Maryland:											
Baltimore	38	58	0	0	0	10	1	0	0	128	205
Cumberland	1	0	0	0	0	0	0	0	0	2	6
Frederick	2	2	0	0	0	0	0	1	0	1	5
District of Col.:											
Washington	26	23	0	0	0	11	0	1	0	12	173
Virginia:											
Lynchburg	1	4	0	0	0	0	0	0	0	9	13
Norfolk	2	5	0	0	0	2	0	3	0	1	-------
Richmond	4	10	0	0	0	6	0	0	0	0	61
Roanoke	2	3	0	0	0	1	0	0	0	3	14
West Virginia:											
Charleston	1	2	0	0	0	1	0	0	0	7	11
Huntington	-------	1	-------	0	0	0	-------	1	0	0	0
Wheeling	2	1	0	0	0	0	0	0	0	11	22
North Carolina:											
Raleigh	1	0	0	0	0	1	0	0	0	3	7
Wilmington	0	0	0	0	0	0	0	0	0	18	6
Winston-Salem	2	1	1	0	0	2	0	0	0	38	18
South Carolina:											
Charleston	1	1	0	0	0	1	0	0	0	0	18
Columbia	0	1	0	0	0	1	0	0	0	0	9
Georgia:											
Atlanta	8	6	1	0	0	4	0	4	1	0	69
Brunswick	0	0	0	0	0	0	0	0	0	0	1
Savannah	0	0	0	0	0	1	0	1	0	2	35
Florida:											
Miami	1	0	0	0	0	2	0	0	0	0	29
Tampa	2	1	0	0	0	0	1	1	0	0	22
EAST SOUTH CENTRAL											
Kentucky:											
Covington	3	0	0	0	0	0	0	0	0	0	27
Lexington	-------	2	-------	0	0	2	-------	0	0	8	12
Tennessee:											
Memphis	10	14	2	1	0	4	1	1	1	17	105
Nashville	2	1	0	0	0	3	0	0	0	5	32
Alabama:											
Birmingham	3	3	1	0	0	4	0	6	0	3	66
Mobile	1	3	0	0	0	1	0	3	1	0	24
Montgomery	0	1	0	0	-------	-------	0	0	-------	1	-------

City reports for week ended February 13, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	0	0	3	0	0	0	0	0	0	----
Little Rock	2	0	0	0	0	2	0	0	0	2	7
Louisiana:											
New Orleans	8	2	0	0	0	12	2	1	2	0	140
Shreveport	1	0	1	2	0	4	0	0	2	8	34
Oklahoma:											
Muskogee	----	2	----	0	----	----	----	0	----	3	----
Texas:											
Dallas	6	9	2	0	0	1	1	0	0	4	61
Fort Worth	5	9	1	0	0	3	1	0	1	0	28
Galveston	1	1	0	0	0	1	0	0	0	0	11
Houston	2	3	6	1	0	3	0	0	0	0	70
San Antonio	1	0	0	0	0	6	0	0	0	0	54
MOUNTAIN											
Montana:											
Billings	0	0	0	0	0	0	0	0	0	0	8
Great Falls	4	2	1	0	0	0	0	0	0	0	10
Helena	0	0	0	0	0	0	0	0	0	0	7
Missoula	1	2	1	0	0	0	0	0	0	0	6
Idaho:											
Boise	1	1	1	2	0	1	0	0	0	0	10
Colorado:											
Denver	15	12	0	0	0	9	0	0	0	6	88
Pueblo	1	0	0	0	0	1	0	0	0	1	12
New Mexico:											
Albuquerque	0	1	0	0	0	6	0	0	0	0	12
Arizona:											
Phoenix	0	0	0	0	0	6	0	0	0	0	----
Utah:											
Salt Lake City	4	3	0	0	0	1	0	0	0	1	31
Nevada:											
Reno	1	0	0	0	0	0	0	0	0	0	8
PACIFIC											
Washington:											
Seattle	12	1	3	4	----	----	0	0	----	18	----
Spokane	8	2	6	0	----	----	0	0	----	0	----
Tacoma	2	2	3	0	0	0	0	0	0	0	28
Oregon:											
Portland	6	1	12	5	0	3	0	0	0	4	72
Salem	1	0	----	0	----	----	----	0	----	0	----
California:											
Los Angeles	46	39	4	4	0	28	3	5	0	16	298
Sacramento	3	4	1	0	0	5	0	0	0	1	50
San Francisco	25	----	1	----	----	----	1	----	----	----	----

City reports for week ended February 13, 1932—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases estimated expectancy	Cases	Deaths
NEW ENGLAND									
Connecticut:									
Bridgeport	0	0	2	0	0	0	0	0	0
MIDDLE ATLANTIC									
New York:									
New York [1]	7	2	2	1	0	0	1	0	0
Rochester	0	0	0	0	0	0	0	1	0
Pennsylvania:									
Pittsburgh	2	3	0	0	0	0	0	0	0
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	1	1	0	0	0	0	0	0	0
Cleveland	1	1	0	0	0	1	0	0	0
Indiana:									
Indianapolis	3	3	0	0	0	0	0	0	0
Illinois:									
Chicago	6	5	0	0	0	0	0	1	1
Michigan:									
Flint	0	0	0	1	0	0	0	0	0
Wisconsin:									
Kenosha	1	1	0	0	0	0	0	0	0
Racine	0	0	0	1	0	0	0	0	0
WEST NORTH CENTRAL									
Iowa:									
Waterloo	1	-------	0	-------	0	-------	0	0	-------
Nebraska:									
Omaha	2	0	0	0	0	0	0	0	0
SOUTH ATLANTIC									
District of Columbia:									
Washington	1	0	0	0	0	0	0	0	0
South Carolina:									
Charleston	0	0	0	0	2	0	0	0	0
Columbia	2	0	0	0	0	0	0	0	0
Georgia:									
Atlanta	1	1	0	0	2	2	0	0	0
Savannah [1]	0	0	0	0	2	1	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Memphis	1	1	0	0	0	1	0	0	0
Alabama:									
Birmingham	0	1	0	0	0	0	0	0	0
Mobile	1	1	0	0	0	0	0	0	0
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans	0	0	0	0	1	1	0	0	0
Texas: [1]									
Fort Worth	0	0	0	0	0	1	0	0	0
MOUNTAIN									
Colorado:									
Denver	0	1	0	0	0	0	0	0	0
Utah:									
Salt Lake City	2	2	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	0	-------	0	-------	0	-------	0	1	-------
California:									
Los Angeles	2	2	0	0	0	0	1	0	0

[1] Typhus fever: 7 cases; 1 case in New York, N. Y., 5 cases in Savannah, Ga., and 1 case in Houston, Tex.

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended February 13, 1932, compared with those for a like period ended February 14, 1931. The population figures used in computing the rates are estimated mid-year populations for 1931 and 1932, respectively, derived from the 1930 census. The 98 cities reporting cases have an estimated aggregate population of more than 34,000,000. The 91 cities reporting deaths have more than 32,400,000 estimated population.

Summary of weekly reports from cities, January 10 to February 13, 1932—Annual rates per 100,000 population, compared with rates for the corresponding period of 1931 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Jan. 16, 1932	Jan. 17, 1931	Jan. 23, 1932	Jan. 24, 1931	Jan. 30, 1932	Jan. 31, 1931	Feb. 6, 1932	Feb. 7, 1931	Feb. 13, 1932	Feb. 14, 1931
98 cities	[2] 88	74	97	[3] 79	84	[3] 88	[4] 79	[3] 78	[5] 79	67
New England	86	91	50	106	96	106	48	84	[6] 65	75
Middle Atlantic	82	56	82	67	69	68	[7] 73	53	75	53
East North Central	[2] 68	95	97	93	68	110	79	96	74	85
West North Central	106	82	102	84	99	109	81	99	89	55
South Atlantic	94	69	108	[3] 65	120	[3] 73	84	[3] 75	59	59
East South Central	81	70	87	76	116	70	[8] 94	53	87	53
West South Central	195	108	260	81	204	183	152	156	168	118
Mountain	43	52	86	35	43	70	60	78	103	78
Pacific	97	47	99	88	63	45	72	69	[9] 78	49

MEASLES CASE RATES

98 cities	[2] 278	324	346	[3] 405	334	[3] 418	[4] 448	[3] 473	[5] 433	521
New England	1,905	310	2,064	522	1,922	438	2,322	502	[6] 2,019	534
Middle Atlantic	116	158	154	251	149	306	[7] 228	353	253	398
East North Central	[2] 182	87	215	80	210	142	321	151	364	183
West North Central	78	1,829	150	1,964	114	1,521	172	1,489	182	1,314
South Atlantic	71	500	110	[3] 806	71	[3] 1,034	196	[3] 1,296	245	1,820
East South Central	6	1,004	17	705	23	916	[8] 0	1,034	17	904
West South Central	73	7	162	10	115	17	198	3	320	17
Mountain	517	374	509	757	509	496	284	1,123	198	687
Pacific	544	55	828	73	938	110	1,138	112	[9] 996	169

SCARLET FEVER CASE RATES

98 cities	[2] 315	316	300	[3] 334	336	[3] 337	[4] 349	[3] 320	[5] 391	348
New England	582	539	640	575	614	519	705	534	[6] 634	683
Middle Atlantic	380	282	361	314	416	328	[7] 447	304	546	322
East North Central	[2] 335	398	312	384	388	377	325	331	385	375
West North Central	220	321	180	323	212	386	284	480	235	474
South Atlantic	239	305	218	[3] 343	214	[3] 313	245	[3] 305	239	320
East South Central	121	470	116	487	127	517	[8] 143	423	127	382
West South Central	99	129	82	142	92	112	106	88	49	105
Mountain	259	331	259	357	207	322	250	261	172	400
Pacific	129	73	128	120	89	143	116	145	[9] 120	123

SMALLPOX CASE RATES

98 cities	[2] 4	16	6	[3] 16	5	[3] 17	[4] 2	[3] 23	[5] 4	18
New England	2	0	7	0	14	0	2	0	[6] 2	0
Middle Atlantic	0	0	0	0	0	0	[7] 0	2	0	0
East North Central	[2] 1	10	3	21	2	25	0	12	1	10
West North Central	17	98	13	77	11	84	9	151	11	84
South Atlantic	0	0	0	[3] 4	0	[3] 0	2	[3] 0	0	0
East South Central	12	18	23	29	6	18	[8] 0	29	6	12
West South Central	16	27	0	34	16	51	13	81	20	132
Mountain	9	78	34	9	9	0	0	44	17	0
Pacific	8	29	27	20	13	18	4	24	[9] 20	29

See footnotes at end of table.

Summary of weekly reports from cities, January 10 to February 13, 1932—Annual rates per 100,000 population, compared with rates for the corresponding period of 1931 [1]—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	Jan. 16, 1932	Jan. 17, 1931	Jan. 23, 1932	Jan. 24, 1931	Jan. 30, 1932	Jan. 31, 1931	Feb. 6, 1932	Feb. 7, 1931	Feb. 13, 1932	Feb. 14, 1931
98 cities	[2] 5	5	7	[3] 6	5	[2] 5	[4] 5	[3] 4	[4] 6	3
New England	0	0	2	2	2	5	2	2	[6] 2	2
Middle Atlantic	4	2	4	3	7	2	[7] 4	1	3	2
East North Central	[2] 2	2	3	3	1	1	4	2	2	1
West North Central	2	4	4	10	6	13	2	2	9	2
South Atlantic	18	10	29	[3] 14	16	[2] 8	4	[3] 18	16	0
East South Central	29	53	12	12	17	18	[8] 31	6	58	29
West South Central	10	14	23	27	3	14	23	24	3	14
Mountain	9	9	0	17	0	0	0	0	0	0
Pacific	0	2	11	6	2	10	4	0	[9] 13	10

INFLUENZA DEATH RATES

91 cities	[3] 14	36	12	[3] 52	13	[3] 70	[4] 13	[3] 61	[6] 18	59
New England	19	10	7	12	5	34	10	46	[6] 17	46
Middle Atlantic	12	59	8	91	9	102	[7] 8	68	13	49
East North Central	[2] 5	9	10	18	11	36	12	52	15	56
West North Central	3	18	6	29	3	29	12	35	26	56
South Atlantic	12	42	24	[3] 38	14	[3] 127	16	[3] 129	18	119
East South Central	44	64	44	64	59	76	[8] 41	64	44	64
West South Central	39	79	13	83	37	100	30	73	44	159
Mountain	103	35	26	44	52	52	52	52	60	17
Pacific	26	10	14	22	9	14	12	12	[9] 7	14

PNEUMONIA DEATH RATES

91 cities	[3] 126	219	120	[3] 229	109	[3] 259	[4] 119	[3] 231	[6] 134	218
New England	103	159	113	178	113	185	144	286	[6] 118	291
Middle Atlantic	133	311	126	332	111	369	[7] 103	293	124	254
East North Central	[2] 82	124	79	126	95	176	96	175	108	182
West North Central	149	212	154	171	113	159	169	136	244	124
South Atlantic	208	237	186	[3] 281	114	[3] 345	165	[3] 325	174	348
East South Central	132	229	107	299	125	229	[8] 157	178	182	166
West South Central	148	228	165	245	125	204	172	214	121	176
Mountain	181	270	147	157	138	200	215	209	172	183
Pacific	158	118	123	103	116	115	109	72	[9] 154	72

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1932, and 1931, respectively.
[2] Fort Wayne, Ind., not included.
[3] Columbia, S. C., not included.
[4] Trenton, N. J., and Covington, Ky., not included.
[5] Barre, Vt., and San Francisco, Calif., not included.
[6] Barre, Vt., not included.
[7] Trenton, N. J., not included.
[8] Covington, Ky., not included.
[9] San Francisco, Calif., not included.

FOREIGN AND INSULAR

AUSTRALIA

Poliomyelitis.—According to a report dated January 21, 1932, there was a considerable increase in the number of cases of poliomyelitis reported in the States of New South Wales, and Queensland, Australia, during the last two months of 1931. Measures were being taken to limit the spread of the disease and to insure adequate treatment of the cases which occur.

The following table shows the number of cases of poliomyelitis which occurred in certain States of Australia and in Tasmania during 1931 and from January 1 to 18, 1932.

	New South Wales	Victoria	Queensland	South Australia	Tasmania
1931					
January	3	21		9	2
February	2	24		13	1
March		36		4	
April	1	60		3	2
May	4	76		3	3
June	3	21		1	1
July		16			
August	2	8	1	2	
September	2	1			
October	3	3		1	
November	13	2	1		
December	54	1	58		
1932					
January 1 to 18	63	1	29		1

CANADA

Provinces—Communicable diseases—Week ended February 6, 1932.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended February 6, 1932, as follows:

Province	Cerebrospinal fever	Influenza	Poliomyelitis	Smallpox	Typhoid fever
Prince Edward Island [1]					
Nova Scotia	1	71			
New Brunswick [1]					
Quebec			1		10
Ontario	1	27	1	1	10
Manitoba			1	5	
Saskatchewan			1	7	
Alberta					3
British Columbia				5	1
Total	2	98	4	18	21

[1] No case of any disease included in the table was reported during the week.

Quebec Province—Communicable diseases—Week ended February 6, 1932.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the week ended February 6, 1932, as follows:

Disease	Cases	Diseases	Cases
Chicken pox	95	Poliomyelitis	1
Diphtheria	26	Puerperal septicemia	1
Erysipelas	8	Scarlet fever	80
German measles	1	Tuberculosis	59
Measles	285	Typhoid fever	10
Ophthalmia neonatorum	1	Whooping cough	51

ITALY

Communicable diseases—Four weeks ended July 26, 1931.—During the four weeks ended July 26, 1931, certain communicable diseases were reported in Italy as follows:

Disease	June 29-July 5		July 6-12		July 13-19		July 20-26	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	33	28	35	31	51	41	42	34
Cerebrospinal meningitis	9	9	10	9	11	8	7	6
Chicken pox	152	82	99	71	78	56	55	35
Diphtheria and croup	257	162	238	159	277	172	270	178
Dysentery	24	13	53	22	90	31	84	35
Lethargic encephalitis	1	1	2	2	1	1	3	3
Measles	1,184	260	1,054	208	1,003	209	652	163
Poliomyelitis	8	8	25	13	17	14	25	20
Scarlet fever	323	116	244	97	253	104	321	111
Typhoid fever	586	298	595	307	816	401	886	415

MEXICO

Tampico—Communicable diseases—January, 1932.—During the month of January, 1932, certain communicable diseases were reported in Tampico, Mexico, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	3	1	Tuberculosis	----	18
Enteritis, various	31	36	Typhoid fever	----	2
Influenza	17	4	Typhus fever	----	1
Malaria	461	20	Whooping cough	18	----
Measles	1	----			

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

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

CHOLERA

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932		
						21	28	5	12	19	26	2	9	16	23	30	6	13	20
Ceylon: Colombo	C	3					1	1	1										
	D	3					1	1	1										
China:																			
Canton	C		2					3											
Hankow	C			8	23	6	5	3					2						
	D			6	1	4	1	1					1						
Shanghai	C	7	126	88	8														
	D		9	13	4														
Swatow	C																		
India	C	36,514	39,223	26,705	15,722	3,451	3,302	3,677	3,884		1								
	D	20,276	21,683	13,257	8,801	1,744	1,713	1,936	2,074										
Bombay	C	44	42	4	5	1	3					1							
	D	25	17	3	1	1	4	1				1							
Calcutta	C	110	46	51	74	22	19	11	22	11	19	10	18	25	26	41			
	D	30	15	23	37	10	11	6	15	6	8	5	6	13	14	23			
Chittagong	C			1										1			5		
Madras	C	6	5															1	
Negapatam	C		1																
Rangoon	C	1		1	1							1							
	D	1		1	1							1							
India (French):																			
Chandernagor	C	7	2	1	1					2			1						
	D	7	2	1	1					2			1						
Karikal	C	1	2	1												12			
	D	1	2													5			
Pondicherry	C	3	4	1															
	D	2	2																
India (Portuguese)	C	2	34	75	48	2	1			1									
	D	2	18	26	11	2	1			1									

Indo-China (see also table below):																			
Cochin-China—Rachgia	C	P																	
Pnompenh	C	1	2	1	4										1	1			
	D	1	2	1											1	1			
Saigon and Cholon	C			1					P	1		1			1				
	D			1															
Iraq:																			
Abulkhasib	C		6																
	D		5																
Amara	C	2	66	4	5	3				2	P								
	D	1	59	1	3	4				2									
Amara Province	C		96	95	35		3												
	D		120	83	24		2												
Basra	C	547	293	157	78														
	D	287	154	84	36														
Basra Province	C	5	53	42	10														
	D	2	30	19	5														
Dinwaniyah	C			1															
Dinwaniyah Province	C			61	23														
	D			44	15														
Iwaniyah	C			23															
	D			15															
Kut Province	C				20														
	D				14														
Muntafiq Province	C		225	209	68	1	1												
	D		145	160	51	3													
Nasiriyah	C		88	33	24	2	6												
	D		75	28	18		7												
Suqelshuyukh	C		2																
	D		2																
Japan: Taiwan—Kelung	C				2														
Persia:[1]																			
Abadan	C			1	3	1													
Ahwaz	C			12	103		9	37	1										
	D			7	98		7	31	1										
Khorramabad	C					18	16	80	45	2	1								
	D					10	10	65	30	9	1								
Mohammerah	C			1															
Philippine Islands:[2]																			
Provinces—																			
Capiz	C		35	79	12		4	16	7	13	4	4	5			13	9	13	10
	D		16	59	9		4	10	5	10	3	3	3			10	8	12	8
Cebu	C	3																	
	D	3																	
Siam	C	1	1																
	D		1																
Ayudhaya Province	C								1										
	D								1										
Bangkok	C	1	1						1					1					
	D								1					1					

[1] On Oct. 23, 1931, cholera was reported at Mohammerah, Abadan, and Ahwaz, Persia. During the period from Oct. 22 to Nov. 7, 1931, 141 cases and 97 deaths were reported.
[2] Figures for cholera in the Philippine Islands are subject to correction.

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

CHOLERA—Continued

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932		
						21	28	5	12	19	26	2	9	16	23	30	6	13	20
On vessel:																			
S. S. Cathay, at Kobe, Japan, from Shanghai	C	4																	
	D	1																	
S. S. Kasagi Maru, at Moji, from Shanghai	C		1																
S. S. Ankoo, at Nagasaki, from Shanghai	C		2																
	D		1																

Place		July, 1931	August, 1931	September, 1931	October, 1931	November, 1931			December, 1931			January, 1932		
						1–10	11–20	21–30	1–10	11–20	21–31	1–10	11–20	21–31
Indo-China (French) (see also table above):														
Cambodia [1]	C	241	12	14	19	3		1		2	1	1	9	2
	D	60	2	7	18					1	1	1	2	2
Cochin-China [1]	C	143	39	18	14	5		1	8	3	3	2	1	2
	D	42	32	13	13	4			5	2		1	1	2

[1] Reports incomplete.

PLAGUE

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
Algeria:																		
Algiers	C	2																
Philippeville	C	2																
	D	1																
Argentina: Cordoba Province [1]	C										1							
Azores:																		
San Miquel Island	C					2	3											
	D						1											
Terceira Island	C					9	7											
	D					4	2											
Belgian Congo	C												1					
British East Africa (see also table below):																		
Tanganyika	C	8	4	13														
	D	2	4	5														
Uganda	C	285	289	276	218	41	38	31	35	28	13	9	13					
	D	281	207	270	211	39	35	30	34	24	15	10	13					
Canary Islands: Palma Island—Los Llanos	C													8				
	D													5	3			
Ceylon: Colombo	C	6	3	4			1						4	1	2		1	
	D	6	3	3			1						4	1	2			
Plague-infected rats		8						1					1	1				
Chile:																		
Santiago	C				1													
	D				1													
Plague-infected rats					1													
Valparaiso	C		1															
China: [2]																		
Shansi Province [3]	C				P													
Shensi Province	C				P													
Dutch East Indies:																		
Batavia and West Java	C	58	65	113	139	44	39	40	75	64	54	39	46					
	D	58	65	113	139	44	39	40	75	64	54	39	46					
Java and Madura	D	205	233	325	512	152	171	167	212	179	151							
Java—Tegal	C																	P

[1] 10 cases of bubonic plague were reported in Cordoba Province, Argentina, in January, 1932. They were distant from railroad and 500 kilometers from ports.

[2] On July 27, 1931, 1,250 cases of plague were reported in Chiobe and Changchow, China, since April. On Sept. 19, 1931, 18 deaths were reported in Changchuanpu and new cases in Kaitung and Fengtien.

[3] On Oct. 17, 1931, plague epidemic was reported in western Shansi Province, China, with 2,000 deaths at Hsinghsien.

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

PLAGUE—Continued

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
Ecuador (see table below).																		
Egypt:																		
Alexandria	C	9	5	1	6		1	1	1					1	1			
	D	3	2		2	1	1	1										
Assiout	C								1	1	1					1		
	D								1	1	1					1		
Beheira	C		2												1	10		
Dakahlia	C	2													1	1		
Girga	C					1		1		1								
	D					1		1		1								
Kena	C					2			2			1	1					
	D					1			2			1	1					
Minieh	C				4			1	1	1		3	3			1		
	D				2					1		3	3			1		
Port Said	C	2			2	2		2			1							
	D					2					1							
Tanta	C	2	2			2										1		
	D					2										1		
France: Rouen—Devilleles	C				P													
Hawaii Territory:																		
Hawaii—Hamakua—Plague-infected rats		1																
Maui Island—																		
Halimaile—Plague-infected rats			1															
Kula District	C	1																
	D	1																
Makawao—Plague-infected rats			1															2
Paia—Plague-infected rats				1														
Paaulo—Plague-infected rats					1													
India	C	664	1,832	2,550	2,493	936	1,092	1,123	1,084	1,131								
	D	440	772	1,147	1,170	362	439	478	460	526								
Bassein	C	2	4	1	1											1		
	D	2	4	1	1													

Bombay	C			1	1		1											1
	D			1			1											1
Plague-infected rats		47	57	42	22	11	13	16	16	17	7	9	9	8	18	14	17	
Madras Presidency	C	28	376	185	91	26	31			30	76	63					22	
	D	24	162	105	40	14	10			3	26	30					14	
Moulmein	C		5															
	D		9	2														
Rangoon	C	1	3		5	1					1	1		1	2	2		
	D	1	2		1	1					1	1			1			
Plague-infected rats		3	4	4	1			1	1		1	1						
Indo-China (see table below).																		
Iraq:																		
Baghdad	C	1	3		2	1	2	1	3	1			1	2	1	1	1	
	D		1			1		1										
Maudhan	C				3	1	1											
	D				1	1												
Madagascar (see also table below): Tamatave	C	1	2	1							1							
Morocco	C			18	2			11										
	D			8	6													
Peru (see table below).																		
Senegal (see table below).																		
Siam	C	1	4	4	5	1	3	1		1				1				
	D		3	3	2		1	1		1								
Spain: Hospitalet—Barcelona Province	C	5	2	2	7													
	D	2	1	1	1													
Syria: Beirut	C	1	2	3	1													
Tunisia: Tunis	C		1	1														
Union of South Africa:																		
Cape Province—Plague-infected rats		1																
Orange Free State	C		P	P		P						P						

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

PLAGUE—Continued

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

Place		July, 1931	August, 1931	September, 1931	October, 1931	November, 1931	December, 1931	January, 1932
British East Africa (see also table above): Kenya	C	484	235	14	64	44	41	5
Ecuador:								
Alamor Parish—Los Hoyos	C	------	------	1	3	------	------	------
Amaluza Parish—Gangochapa	C	------	------	------	2	------	------	------
Calvas Canton—Cariamanga	C	------	------	4	1	------	------	------
Overjeria	C	1	------	------	------	------	------	------
Celicia Canton—Choras	C	------	------	------	1	------	------	------
Chimborazo Province—Aldusi	C	------	------	------	------	------	------	3
Guamote	C	------	------	------	------	------	------	8
Loja Canton—Lapaz	C	------	------	20	------	------	------	------
Naimuro	C	------	------	------	2	------	------	------
Paterillo	C	1	------	------	------	------	------	------
Tuburo	C	------	------	------	7	------	------	------
Palas Canton—San Antonio	C	------	------	1	1	------	------	------
Indo-China	C	1	------	4	3	------	9	16
	D	1	------	4	1	------	5	9
Madagascar (see also table above):								
Ambositra Province	C	1	2	1	8	39	------	------
	D	1	1	1	5	37	------	------
Antisirabe Province	C	13	22	19	17	27	------	------
	D	12	22	19	17	27	------	------
Maevatanana Province	C	------	------	------	------	4	------	------
	D	------	------	------	------	4	------	------
Miarinarivo Province	C	8	20	14	18	10	------	------
	D	7	19	12	16	9	------	------
Moramanga Province	C	1	3	12	13	25	------	------
	D	------	3	11	11	25	------	------
Tananarive Province	C	5	45	65	120	186	------	------
	D	5	44	63	117	178	------	------
Peru	C	3	19	2	------	------	------	------
	D	2	14	2	------	------	------	------
Barranca—Chancay	C	------	------	------	------	4	------	------
	D	------	------	------	------	1	------	------
Callao—Plague-infected rats		------	1	------	------	------	------	------
Peru—Continued.								
Chepen—Pacasmayo	C	------	------	------	------	------	1	------
	D	------	------	------	------	------	1	------
Eten—Chiclayo	C	------	------	1	------	------	------	------
	D	------	------	1	------	------	------	------
Huancabamba—Ayacaba	C	------	------	------	7	------	------	------
	D	------	------	------	6	------	------	------
Huaura—Chancay	C	------	------	1	------	------	------	------
	D	------	------	1	------	------	------	------
Plague-infected rats		------	------	------	1	------	------	------
La Samana—Hualgayoc	C	------	------	------	------	4	------	------
Lima—Lima	C	------	------	------	------	1	------	------
	D	------	------	------	------	1	------	------
Lima—Lima (haciendas)	C	------	------	------	------	2	------	------
	D	------	------	------	------	1	------	------
Paijan—Trujillo	C	------	------	------	------	1	------	------
Palulo—Hualgayoc	C	------	------	------	------	10	------	------
	D	------	------	------	------	5	------	------
Patrovilca—Chancay	C	------	------	------	------	1	------	------
	D	------	------	------	------	1	------	------
Quispampa—Huancabamba	C	------	------	------	1	------	------	------
	D	------	------	------	1	------	------	------
San Pedro—Pacasmayo	C	------	------	------	------	1	------	------
Supe—Chancay	C	------	------	------	------	2	------	------
	D	------	------	------	------	1	------	------
Senegal:								
Baol [1]	C	27	101	13	6	2	------	------
	D	13	58	8	2	------	------	------
Dakar [1]	C	95	194	45	4	------	------	------
	D	73	106	31	4	------	------	------
Diourbel [1]	C	------	------	13	------	10	------	------
	D	------	------	5	------	5	------	------
Louga [1]	C	3	2	10	1	19	------	------
	D	1	1	4	2	10	------	------
Rufisque [1]	C	34	2	1	7	12	------	------
	D	------	------	------	1	2	------	------
Thies [1]	C	16	26	12	7	16	1	------
	D	7	16	8	5	7	1	------
Tivaouane [1]	C	3	------	------	------	------	------	------
	D	2	------	------	------	------	------	------

[1] Reports incomplete.

SMALLPOX

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
Aden	C																2	
Algeria:																		
Algiers	C				1					1								
Constantine	C		1															
Brazil:																		
Porto Alegre (alastrim)	C	34	48	46	57	9	8	15	19		14							
	D	1	4	2	3			1			1							
Santos	C								1					2				
Rio de Janeiro	C										1							
British East Africa: Tanganyika	C	19	50	1,184	18	2							55					
	D		5	97	2								4					
British South Africa:																		
Northern Rhodesia	C	26		1														
Southern Rhodesia	C		3										1					
Canada:																		
Alberta	C	1		12	6		2	1		9		2						
British Columbia [1]	C	5	2		2								2	1	4	8	5	
Manitoba	C		1			1	1								5		5	
Winnipeg	C		1															
Nova Scotia	C						1											
Ontario	C	5	6	17	15	3	2	5	1	10		2	2	3	2		1	
Kingston	C		1															
North Bay	C													1				
Ottawa	C		1	8	12													
Toronto	C						1											
Quebec	C											2	1		1			
Saskatchewan	C	26	33	11	33	12	5	9	8			1	10	21	7		7	
Regina	C			2														
Chile:																		
Santiago	C				3													
	D				2													
Tocopilla	C											2						

[1] 33 cases of smallpox, with 9 deaths, were reported up to Feb. 8, 1932, in Vancouver, British Columbia, Canada.

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

SMALLPOX—Continued

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
China:																		
Amoy	C	1	1	2	8	2	5	11	28	60	66	49	43	37	60	54	32	35
	D	1	1	1	6	-----	4	7	25	22	20	19	18	14	28	20	29	11
Canton	C	-----	1	-----	2	6	3	2	3	6	3	5	4	3	11	5	8	-----
Foochow	C	P	P	P	P	-----	P	-----	P	-----	P	-----	P	-----	-----	-----	-----	-----
Hankow	C	3	-----	1	18	5	8	11	5	1	6	34	6	-----	-----	-----	-----	-----
	D	-----	-----	-----	-----	-----	4	-----	2	1	1	7	3	-----	-----	-----	-----	-----
Hong Kong	C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	1	-----	4	2	-----
	D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	1	4	-----
Manchuria—Dairen	C	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Nanking	C	1	-----	-----	-----	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Shanghai—																		
Foreigners only	C	-----	-----	98	21	16	13	20	23	16	40	18	41	43	48	40	32	-----
Including natives	D	1	2	13	2	10	6	8	7	8	13	6	14	11	21	17	13	-----
Swatow	C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2	-----	-----	-----	-----	-----	-----
Tientsin	C	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chosen (see table below).																		
Colombia:																		
Cali	C	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----
Santa Marta	D	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Egypt: Cairo	C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
Eritrea	C	-----	10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	D	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
France (see table below).																		
Great Britain:																		
England and Wales	C	97	97	161	220	55	56	57	48	44	32	54	68	68	55	55	49	-----
London	C	26	32	58	129	38	27	35	18	18	14	28	40	24	36	22	18	-----
London and Great Towns	C	69	88	128	179	48	48	53	42	31	22	43	56	60	45	37	46	-----
Honduras:																		
Ceiba	C	-----	-----	14	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Puerto Castilla	C	-----	-----	1	1	-----	-----	-----	-----	1	-----	1	1	-----	-----	1	-----	-----
Tegucigalpa	C	-----	-----	-----	-----	-----	8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Trujillo	C	-----	1	1	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

India	C	2,927	1,705	1,451	1,152	414	557	561	766	362								
	D	746	433	224	246	94	118	713	141	84								
Bassein	C														1		2	
Bombay	C	2	5			1				2			1	3	1	3	1	
	D	1	1			1				1			1			2		
Calcutta	C	13	5	1	1			1			1	1	5	7	3	7		
	D	9	5	1	1			1			1	1	1	3	1	3		
Cochin	C	3		8	5										1			
Karachi	C	1			1			4	1	2	1			2	2	12	2	
	D													2	1	2	1	
Madras	C	1	1	13	5		2	2	3	1	2	3	1	1	3	3	2	
	D			2			1		1		1	1			2	1		
Moulmein	C													1			3	
Negapatam	C	2	4	2	1				1									
	D			1	1				1									
Rangoon	C	4	2	3	3	2	2	2	3	4	4	18	13	15	35	58	39	
	D	2	1	2	1	2	2	1	2	1		2	7	7	8	15	10	
Tuticorin	C		2	4	5		4	4		2	2		2		19	9		
	D			1	1										2			
Vizagapatam	C	5	6	6									2					
	D	4	6	1														
India (French):																		
Karikal	C	7	7	8	4	1		2	4			4						
	D	6	3	4	3	1		2	4			2						
Pondicherry Province	C	20	26	23	38	9	6	5	6	10	7	1	4	4		4		
	D	20	24	21	36	9	5	5	6	10	7	1	4	4		4		
Indo-China (see also table below):																		
Pnompenh	C														1			
Saigon and Cholon	C	2	6	6	7	4	6	7	9	13	8	3	8	23	28	43	23	
	D	1	3	3	5	2	1	3	6	9	6	2	7	18	22	35	17	
Iraq:																		
Baghdad	C		1				1	4	6	3	4	4	4	5	2	2		
	D						1	2	2	1	2	2	3	9	2	2		
Basra	C												1		1	1		
	D												2					
Mosul Liwa	C	1		5														
Ivory Coast (see table below).																		
Jamaica	C							1										
Japan:																		
Taiwan	C																	55
Yokohama	C						1						1	2				
Mexico (see also table below):																		
Jalisco (State)—Guadalajara	D	2		4	2	1				1				2			1	
Mexico City and surrounding territory	C	10	5	7	5	3	4	2	1	6			2		3			
	D	2	2	4	1													
Monterrey	C				2									1				
San Luis Potosi	D											1	1	2	1	2		
Torreon	C		2	1			1	5	1				2	2		3	1	
	D		1										2	1			1	

Morocco (see table below).

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

SMALLPOX—Continued

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

Place		July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	Week ended— November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
Netherlands: Friesland—Opsterland	C				[1] 1													
Nigeria	C			454	69	15												
	D			141	15	1												
Panama: Chiriqui	C							3										
Poland	C		1		2				1	1								
Portugal:																		
Lisbon	C	37	66	48	78	22	23	21	25	35	14	26	33	38	22	31		
Oporto	C	1					1		1	1			1	2			1	
Rumania (see table below).																		
Siam	C		3							8			5					
Straits Settlements	C	1									2						4	
Sudan (Anglo-Egyptian)	C		32			2							2			3		
	D		6														1	
Sweden: Malmo	C															9		
Syria (see table below).																		
Tunisia: Tunis	C												1					
Union of South Africa:																		
Cape Province	C				P	P	P	P	P	P	P	P	P					
Natal	C	P	P															
Orange Free State	C	P	P	P														
Transvaal	C				P	P												
On vessel:																		
Brazilian ship Jaboatao at New Orleans from Brazil	C											1						
S. S. Taif (pilgram ship) at Suakin from Jeddah	C	1																
S. S. Bellasco at Mobile, from Habana, Cuba, and Hull, England	C												1					

Place		August, 1931	September, 1931	October, 1931			November, 1931			December, 1931			January, 1932		
				1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31
Indo-China (see also table above)	C	72	39	10	11	26	20	2	98	144	41	324	11	107	191
	D	26	12	3	3	10	4		18	17	21	55	11	52	85
Ivory Coast	C	7					1								
	D	4					1								
Syria: Beirut	C												2	3	

Place		August, 1931	September, 1931	October, 1931	November, 1931	December, 1931	January, 1932
Chosen	C	19	9	7	2		1
	D	7	1	1			
France	C		4		6	1	
Mexico (see also table above)	D	731	565				
Morocco	C	23	59	91	152	279	100
Rumania	C	1					

[1] Imported case.

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

TYPHUS FEVER

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

Place		Week ended— July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Oct. 18–Nov. 14, 1931	November, 1931		December, 1931				January, 1932					February, 1932	
						21	28	5	12	19	26	2	9	16	23	30	6	13
Algeria:																		
Algiers	C			1	2					1		3		1				
Bone	C	2																
Constantine Department	C	1	2	1	38	1		1	1	1		3	1	2				
Geryville	C													5		2		
Oran	C	1	1		1	1												
Bulgaria	C		1		2		2		2	1	14	1	6	16				
	D									1	1	1						
Chile:																		
Antofagasta	C				1						1					1		
Santiago	C				34	3												
China:																		
Manchuria—Harbin	C		1															
Shanghai	C	1		1														
Chosen (see table below).																		
Colombia: Cali	D		1															
Czechoslovakia (see table below).																		
Egypt:																		
Alexandria	C		2							3		1	1					1
Beheira	C				1						7							
Cairo	C		1						1									
Gharbieh	C				1						1							
	D				1													
Provinces	C											11		4		13	26	11
	D											2				2	1	2
Greece (see table below).																		
Guatemala (see table below).																		
Irish Free State:																		
Donegal County—Stranorlar	C								2									
Limerick County—																		
Croom	C			1														
Glin	C		2	1														
Limerick	C	1							1									
Rathkeale	C			1														
Mayo County—																		
Castlebar	C	1																
Westport	C	1																

Waterford County—Lismore	C											1						
Lithuania (see table below).																		
Mexico:																		
Guadalajara	D	1									1							
Mexico City, including municipalities in Federal District	C	18	10	14	16	7	3	5	7	4	3	3	1	5	10			
	D	10	4	8	4	1	1	1	1	2	1	1	2	1	4			
San Luis Potosi	D	1									1							
Torreon	C			2	3													
	D			2	6													
Morocco	C	8		4	1			11	6	4	1	1	3		2	1	3	
	D								2	1								
Palestine	C	11	4	6	3		1			2	1		1	1	1	1	1	
Paraguay: Asuncion	D		1															
Peru [1]																		
Poland	C	31	11	14	20	16	36	32	22	68	30	46	49	69	61			
	D	2		1	3	2	2		6	5	5	3	1	4				
Portugal: Oporto	C		2		3											1		
Rumania	C	23	13	18	38	13	13	13	29	25	41	42						
	D	2	1	3	9	1	1	2	2	4	5	1						
Tunisia: Tunis	C		3		3			26			1		1					13
	D							2										1
Turkey (see table below).																		
Union of South Africa:																		
Cape Province	C	P	P	P	P		P	P	P	P	P	P						
Municipality of East London	C		P															
Natal	C	P	1	P			P	P	P	P		P						
Orange Free State	C			P	P				P	P	P	P						
Transvaal	C	P	P	1	P	P	P	P	P	P	P	P						
Venezuela: Caracas (see table below):																		
Yugoslavia (see table below).																		
On vessel: At Antofagasta, from Iquique and points north	C										1							

Place		June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931	December, 1931
Chosen: Seoul	C	6	1	33	12	24	4	
	D	1	1	5		1	1	
Czechoslovakia	C	2				18		10
Greece	C	9	2	13	9	12	4	6
	D			2	1			1
Guatemala	C	33	34	3				
	D	15	5					

Place		June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931	December, 1931
Lithuania	C	13	8	2		5	9	
	D	2				1		
Turkey	C	11	9		16	11	14	21
Venezuela: Caracas	D							1
Yugoslavia	C	2	3	1				

[1] Typhus fever has been reported in Peru from May to November, 1931, 153 new cases being reported during the months of October and November. The disease has not spread to the coastal regions.

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

YELLOW FEVER

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

Place		May 31–June 27, 1931	June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Week ended— Sept. 26, 1931	October, 1931					November, 1931				December, 1931	
							3	10	17	24	31	7	14	21	28	5	12
Brazil:																	
Alagoas State	C			3													
	D			2													
Maceio	D											1					
Utinga	C											3					
	D											2					
Ceara State	C	1		1													
	D			1													
Sobral	C										1						
	D											1					
Pernambuco State	C				2												
	D				2												
Pau d'Alho	C													1			
	D													1			
Recife	C					1											
	D					1											
Sergipe State	C	1															
British Cameroons: Mamfe	C	2															
Colombia: Magdalena Province—Near Cienaga	C		4														
Gold Coast:																	
Akuse	C		2														
	D		1														
Dagomba District	C			4										1			
Kete Krachi	C							1									
Kintampo	C		1														
	D		1														
Oda	C				1											†	
	D				1												
Salaga	C															1	
	D															1	
Tamale	C		2			2				1					2	1	
	D		2			2											
Wale Wale	C			1													
	D			1													

Ivory Coast:																		
Bobo Dioulasso	C		1															
	D		1															
Grand Bassam	C			4	1													
	D			2	1													
Kong Circle	C		4															
Seguela	C			P														
Tehini	C												1					
Nigeria	C			1							1			1		2		
	D			1										1		2		
Senegal:																		
Podor (Hinterland)	C			1														
	D			1														
St. Louis	C					1												
Thies	C					1												
	D					1												
Sudan (French)	C		4															
Macina—Kayo Circle	C													2				
	D													2				
Togo (French): Atakpame—Anie Circle	C												1					1
	D												1					
Upper Volta:																		
Banfora	C		2			2												
	D		1			1												
Dedougou	C										2							
Diarabakoko	C					2												
	D					1												
Ouagadougou	C				1	1			1									