Public Health Reports

Vol. 57 • JULY 17, 1942 • *No.* 29

STUDIES OF SEWAGE PURIFICATION

XVI. DETERMINATION OF DISSOLVED OXYGEN IN ACTIVATED SLUDGE-SEWAGE MIXTURES[1]

By C. C. RUCHHOFT, *Principal Chemist*, and O. R. PLACAK, *Assistant Chemist*. *United States Public Health Service*

The importance of dissolved oxygen in activated sludge aeration liquors to the successful operation of the process is well known. Only

[1] From the Division of Public Health Methods, National Institute of Health. Preceding papers in this series are:

Theriault, E. J., and McNamee, P. D.: Studies of sewage purification. I. Apparatus for thedetermination of dissolved oxygen in sludge-sewage mixtures. Pub. Health Rep., 50: 480 (1935). Reprint 1680.

Butterfield, C. T.: Studies of sewage purification. II. A zooglea-forming bacterium isolated from activated sludge. Pub. Health Rep. 50: 671 (1935). Reprint 1686.

Theriault, E. J.: Studies of sewage purification. III. The clarification of sewage. A review. Sewage Works J., 7: 377 (1935). Pub. Health Rep., 50: 1581 (1935). Reprint 1715.

Smith, I ussell S., and Purdy, W. C.: Studies of sewage purification. IV. The use of chlorine for the correction of sludge bulking in the activated sludge process. Sewage Works J., 8: 223 (1936). Pub. Health Rep., 51: 617 (1936). Reprint 1746.

McNamee, P. D.: Studies of sewage purification. V. Oxidation of sewage by activated sludge. Sewago Works J., 8: 562 (1936). Pub. Health Rep., 51: 1034 (1936). Reprint 1774.

Butterfield, C. T., Ruchhoft, C. C., and McNamee, P. D.: Studies of sewage purification. VI. Biochemical oxidation by sludges developed by pure cultures of bacteria isolated from activated sludge. Sewage Works J., 9: 173 (1937). Pub. Health Rep., 52: 387 (1937). Reprint 1812.

Ruchhoft, C. C., McNamee, P. D., and Butterfield, C. T.: Studies of sewage purification. VII. Biochemical oxidation by activated sludge. Sewage Works J., 10: 661 (1938). Pub. Health Rep., 53: 1690 (1938). Reprint 1987.

Butterfield, C. T., and Wattie, Elsie: Studies of sewage purification. VIII. Observations on the effect of variations in the initial numbers of bacteria and of the dispersion of sludge flocs on the course of oxidation of organic material by bacteria in pure culture. Pub. Health Rep., 53: 1912 (1938). Reprint 1999.

Ruchhoft, C. C., Butterfield, C. T., McNamee, P. D., and Wattie, Elsie: Studies of sewage purification. IX. Total purification, oxidation, adsorption, and synthesis of nutrient substrates by activated sludge. Sewage Works J., 11: 195 (1939). Pub. Health Rep., 54: 468 (1939). Reprint 2050.

Ruchhoft, C. C., and Smith, R. S.: Studies of sewage purification. X. Changes in characteristics of activated sludge induced by variations in applied load. Sewage Works J., 11: 409 (1939). Pub. Health Rep., 54: 924 (1939). Reprint 2074.

Ruchhoft, C. C., Kachmar, J. F., and Moore, W. A.: Studies of sewage purification. XI. The removal of glucose from substrates by activated sludge. Sewage Works J., 12: 27 (1940). Pub. Health Rep., 55: 393 (1940). Reprint 2142.

Ruchhoft, C. C., Kachmar, J. F., and Placak, O. R.: Studies of sewage purification. XII. Metabolism of glucose by activated sludge. Pub. Health Rep., 55: 582 (1940). Reprint 2149.

Lackey, James B., and Wattie, Elsie: Studies of sewage purification. XIII. The biology of *Sphaerotilus natans* kutzing in relation to bulking of activated sludge. Pub. Health Rep., 55: 975 (1940). Reprint 2166.

Ruchhoft, C. C. and Kachmar, J. F.: Studies of sewage purification. XIV. The role of *Sphaerotilus natans* in activated sludge bulking. Public Health Rep., 56: 1727 (1941). Reprint 2309.

Butterfield, C. T. and Wattie, E.: Studies of sewage purification. XV. Effective bacteria in purification by trickling filters. Public Health Rep., 56: 2445 (1941).

within the past 10 years, however, have attempts been made to use dissolved oxygen data as criteria of plant operation. The desire for information concerning the dissolved oxygen content of activated sludge mixed liquors was expressed by Theriault and McNamee (*1*) in studying bulking problems in 1934. Since then Klassen (*2*), Anderson (*3*), Heukelekian (*4*), and Poindexter (*5*) have all pointed out the importance of this determination for purposes of activated sludge plant control. While the use of the dissolved oxygen determination on mixed aeration liquors is becoming widespread in activated sludge plant operation, no entirely satisfactory method for its determination has been proposed or developed.

Three primary characteristics of activated sludge make it difficult to determine dissolved oxygen in aeration mixtures. The first and most important is the presence of the zoogleal sludge floc with its adsorbed organic matter. This floc, regardless of its condition, contains 60 to 90 percent of organic matter and interferes with the ordinary Winkler or other similar chemical determination of dissolved oxygen. The second characteristic is the biochemical oxidizing capacity and oxygen demand of the sludge floc, which may use 100 mg. or more of O_2 per liter per hour. The third characteristic which introduces difficulty is the very frequent presence of nitrites in the mixed liquor, which interferes with the ordinary Winkler determination. The ideal method for the determination of dissolved oxygen in sludge liquors, therefore, is one which removes the sludge floc, stops biochemical and chemical oxidation or interference, destroys nitrites, and is simple and easy to use. Kuchler (*6*) designed an apparatus for separating the sludge and supernatant, which overcame only the first difficulty, but bulking sludge could hardly be separated quickly enough in the apparatus. However, Kuchler did recommend the use of the azide procedure of Alsterberg to destroy nitrites.

Konstantinowa (*7*) proposed the use of mercuric chloride to stop biochemical oxidation. After the sludge settled, the supernatant was siphoned off and its dissolved oxygen content was determined, using the Rideal-Stewart modification to oxidize nitrites and prevent their interference. Theoretically this procedure should be satisfactory, but practical difficulties were observed by Goldthorpe (*8*) who found that mercuric chloride did not completely arrest absorption of oxygen and tended to disperse the sludge floc and prevent settlement. Watson (*9*) also used mercuric chloride to stop oxidation and followed this by precipitation of the mercury salt and coagulation of the floc with sodium hydroxide. In view of the increase in rate of chemical oxidation at high pH this practice seems undesirable. The use of mercuric chloride seems unsatisfactory and leads to other difficulties as found by both investigators and consequently will not be further reviewed here.

Theriault and McNamee (*1*) overcame all difficulties in determining dissolved oxygen in sludge mixtures by developing an apparatus with which the gases in solution were extracted from a sludge sample. The oxygen in the extracted gas was then determined by the Winkler method in a special apparatus. While this procedure is satisfactory for research, it requires special apparatus, decidedly limits the number of samples that can be examined, and has not been adopted in practice.

In their early paper on oxygen demands of activated sludge, Kessler and Nichols (*10*) used copper sulfate for the prevention of biochemical oxidation. They ascribe the first use of the reagent for this purpose to Palmer and Beck.[3] Kessler and Nichols used the short Winkler procedure suggested by Theriault (*12*) to shorten the period of alkalinization of the supernatant in the absence of iron and nitrites. However, the effectiveness of copper sulfate in preventing biochemical oxidation has apparently not been thoroughly studied. Goldthorpe, who also adopted copper sulfate as a more satisfactory respiratory inhibitor than mercuric chloride for use with activated sludge, notes that this salt in the concentrations used did not completely arrest oxygen absorption.

Recently it was shown (*12*) that the sulfuric acid-sodium azide treatment of river and sewage plant effluent samples stopped biochemical oxidation and enabled a delayed dissolved oxygen determination. The use of sodium azide to destroy nitrites previous to and in the Winkler determination has also been carefully studied (*12*, *13*, *14*) and found satisfactory for general biochemical oxygen demand work, where ferrous iron is not present. It has also been found (*15*) that sulfamic acid is effective in destroying nitrites previous to the dissolved oxygen determination in stream pollution and sewage treatment studies. In consideration of these developments a reinvestigation of procedures for determining dissolved oxygen in activated sludge mixtures has been made.

EXPERIMENTAL

In the first series of experiments, four duplicate samples were collected in liter bottles from our experimental sludge plant aeration chamber. The first sample was untreated and was immediately centrifuged in special ground glass stoppered bottles, the dissolved oxygen in the supernatant being determined by the azide modification. The other three samples were collected in bottles to which had been added sulfuric acid, a mixture of sulfuric acid and sodium azide, and copper sulfate solutions, respectively. The dissolved oxygen in the supernatant from each sample was determined by the azide modification. The results obtained with three bulking sludges using the above procedure are compared in table 1. These data show that, whereas a

[3] John P. Palmer and A. J. Beck. The Sanitary District of Chicago (1934). Unpublished data.

mean dissolved oxygen of 5.94 p. p. m. was found in the untreated sample, this rapidly disappeared. The sulfuric acid and sulfuric acid-azide treated samples showed a mean initial dissolved oxygen of 6.38 p. p. m. and this value was slowly reduced in the sulfuric acid treated sample and even more slowly reduced in the sulfuric acid-azide treated sample. The copper sulfate treated sample had a mean initial dissolved oxygen of 7.55 p. p. m., or over 1 p. p. m. higher than the other treated samples. The dissolved oxygen was apparently lost more rapidly than in the sulfuric acid or sulfuric acid-azide treated samples. These experiments indicate that the copper sulfate treatment of sludge is inferior in arresting oxygen absorption but gives higher immediate values.[3]

TABLE 1.—*Comparison of dissolved oxygen found by various procedures in activated sludge mixed liquors*

[All dissolved oxygen values are the mean of 2 determinations]

Sludge No.	Temperature, °C.	NO_2, parts per million	Suspended solids	Sludge index	Time in minutes after collection and treatment											
					Initial				30				60			
					A	B	C	D	A	B	C	D	A	B	C	D
1	13	2.0	2528	370	5.40	6.20	6.20	7.36	0.08	5.48	5.73	5.42	0.09	4.74	5.32	4.22
2	8	2.0	2092	468	8.18	8.15	8.15	9.30	1.57[1]	7.72	7.80	8.38	.00	7.29	7.52	7.66
3	23	....	1222	704	4.23	4.78	4.78	5.96	1.00[1]	4.41	4.69	4.50	.00	4.25	4.63	4.23
Mean	....	....	....	....	5.94	6.38	6.38	7.55	.55	5.87	6.07	6.10	.03	5.42	5.82	5.37

[1] 20 minutes after collection.

A. Untreated sample—dissolved oxygen by the azide modification.
B. Collection bottle dosed with H_2SO_4, dissolved oxygen by azide modification.
C. Collection bottle dosed with H_2SO_4 and NaN_3, dissolved oxygen by azide modification.
D. Collection bottle dosed with $CuSO_4$, dissolved oxygen by Rideal Stewart modification.

In the second series of experiments, eight different treatments were compared to the copper sulfate treatment for determining the dissolved oxygen content immediately after collection. In these experiments 12 gallons of activated sludge mixture were aerated in a conical bottomed aeration vessel in the laboratory. Two parallel siphons were arranged in this vessel so that sludge samples could be siphoned into two bottles simultaneously to insure duplicate samples. The reagent or reagents to be studied were put into one 1,200 ml. glass stoppered bottle and 10 ml. of a 10 percent copper sulfate solution into a similar bottle. The sludge samples were then siphoned into both bottles simultaneously until the bottles were completely filled. The stoppers were inserted, the contents mixed for 5 to 10 seconds, and after settling

[3] It may be supposed that the higher dissolved oxygen values obtained with copper sulfate treatment are due to the reduction of the copper by the potassium iodide in acid solution. Investigation showed that the concentration of potassium iodide used in the dissolved oxygen determination was not sufficient to induce this reaction. If three or four times the usual amount of potassium iodide is used during the dissolved oxygen determination, appreciable amounts of iodine (equivalent to 0.1–0.2 p. p. m. of oxygen) will be released from the iodide by the copper.

for 5 to 10 minutes the supernatant was siphoned into 300 ml. dissolved oxygen bottles. The dissolved oxygen in all samples was then determined by the short Winkler technique with sodium azide in the alkaline iodide (*11*, *12*) solution.

The following reagents were employed for floc coagulation and arresting biochemical oxidation in the various tests:

(1) Ten percent solution of copper sulfate.
(2) Concentrated sulfuric acid.
(3) Two percent sodium azide solution.
(4) Standard Methods manganous sulfate solution containing 4 percent sulfamic acid.
(5) Glacial acetic acid.
(6) Dilute acetic acid (1 to 4 dilution of glacial acid).
(7) Two percent solution of sulfamic acid.

These reagents were used in the amounts and combinations shown in table 2, and each combination was used in one bottle of a pair, the other bottle containing only 10 ml. of copper sulfate. The pair of bottles in each experiment was filled with sludge samples simultaneously as described. The results obtained are shown in table 2.

TABLE 2.—*Comparison of treatment procedures for coagulation and prevention of oxygen absorption of activated sludge in the determination of dissolved oxygen*

Experiment No.	Treatment used to compare with $CuSO_4$	pH resulting from sludge treatment		Dissolved oxygen			
				Found in sample, parts per million		Deviations	
	Reagents added to 1,200 ml. bottle	Treatment described at left	$CuSO_4$ only	Treatment described	$CuSO_4$ only	Parts per million	Percent
1	10 ml. $CuSO_4$ solution+2.8 ml. concentrated H_2SO_4	1.6	4.8	6.28	6.29	−0.01	0.16
2	2.8 ml. concentrated H_2SO_4+5 ml. NaN_3 solution	1.6	4.7	5.62	6.32	−.70	11.07
3	10 ml. $MnSO_4$—sulfamic acid+5 ml. NaN_3 solution	2.9	4.6	6.80	7.00	−.20	2.85
4	3 ml. glacial acetic+5 ml. NaN_3 solution	3.4	4.4	7.26	7.34	−.08	1.09
5	2 ml. glacial acetic+5 ml. NaN_3 solution	3.5	4.4	7.16	7.11	+.04	.53
6	4 ml. sulfamic acid solution+5 ml. NaN_3 solution	4.8	4.8	2.95	2.99	−.04	1.34
7	8 ml. sulfamic acid solution+5 ml. NaN_3 solution	4.4	4.8	4.92	5.00	−.08	1.60
8	1 ml. dilute acetic+5 ml. NaN_3 solution	4.4	4.6	5.25	5.27	−.02	.37

These data show that the copper sulfate treatment of these sludges reduced the pH to within the range of 4.4 to 4.8 in all experiments. Using other reagents the sludge pH was adjusted to values between 1.6 and 4.8 in the different experiments. Experiment 2 (table 2) which was repeated several times, indicated that when the sludge is treated with sulfuric acid and azide to lower its pH to about 1.6, a lower percentage recovery of the dissolved oxygen results than with copper sulfate treatment. However, when the pH is lowered to 1.6 with sulfuric acid in the presence of the copper salt as in experiment 1, no detrimental effect upon the dissolved oxygen recovery was observed. In experiment 3 the pH was lowered to 2.9 with a solution of manganous sulfate containing 4 percent sulfamic acid. In this case the deviation from the dissolved oxygen result obtained with copper sulfate alone was only 2.85 percent. In the remaining experiments the pH was adjusted between 3.4 and 4.8 with various treatments and the oxygen recovery deviation was always less than 2 percent. This series of experiments indicated that it was possible to treat and coagulate activated sludge with a number of reagents and obtain dissolved oxygen results practically identical with those obtained with copper sulfate treatment. If the treatment is such that the pH is reduced below about 3.0, oxygen is apt to be lost; while if the pH is 4.8 or above with these reagents, the coagulation is poor so that the time required for settling may be prolonged, especially with a bulking sludge.

The effectiveness of various preliminary treatments in stopping biochemical oxidation was next studied in a series of experiments. The activated sludge was aerated in the conical bottomed vessel and sludge samples were withdrawn over a 4-hour period to study five treatment methods. On the succeeding day the aeration vessel was refilled and samples were withdrawn to complete the experiment with six additional treatment methods. All these experiments were, therefore, conducted using two batches of sludge. While there was, no doubt, some difference in the oxygen demand of the sludge mixture during the course of these experiments, the range of this variation is not considered sufficient to impair the results obtained.

Each sludge treatment using one or a combination of reagents was studied as follows: The dose of reagents to be studied was introduced into each of eight 500 ml. glass stoppered bottles. These bottles were then filled as rapidly as possible, two being filled at a time with the twin siphons. After mixing the contents of all bottles the first and last bottle filled were taken for the initial dissolved oxygen (D. O.) determination. As in the previous series the sludge was allowed to settle for 5 minutes, after which the supernatant was siphoned into D. O. bottles. The short Winkler technique employing the alkaline iodide reagent containing sodium azide was used on all dissolved oxygen determinations. After final acidification, however, each dissolved oxygen sample was allowed to stand 2 minutes before titration. The other 6 bottles of the treated sludge were shaken at 2 minute intervals to keep the sludge in contact with the supernatant until the time when the dissolved oxygen in them was to be determined. The dissolved oxygen was determined on two of these after 30 minutes, on another pair after 90 minutes, and on the final pair after 180 minutes of this treatment. After the analysis for dissolved oxygen in the 30-minute samples with one treatment combination had been completed, another set of eight bottles was prepared with another combination of reagents and the sludge mixture added in the manner described, followed by identical analytical treatment. This process was repeated until all of the desired reagents or combinations of reagents had been studied. The mean results from the duplicate bottles in each experiment are shown in table 3. The results indicated by footnote (1) are those in which the duplicates did not check within 0.3 p. p. m. The control experiments in this table indicated that the untreated sludge absorbed oxygen rapidly, for only 35 to 40 percent of the initial quantity present remained after 15 minutes. Experiments 10 and 11 showed that sodium azide alone was not effective in stopping biochemical oxidation. In experiment 11 about 10 times the concentration of this reagent ordinarily used to destroy nitrite in the dissolved oxygen determination decreased the oxygen absorption so that 52.9 percent of the original was recovered after 30 minutes.

TABLE 3.—*Comparison of treatment procedures for the prevention of oxygen adsorption in activated sludge*

Experiment No.	Treatment used to stop biochemical oxidation. (Reagents added to a 500 ml. bottle)	pH resulting from treatment	Dissolved oxygen present after indicated time in minutes, parts per million					Percent of dissolved oxygen recovered after the indicated time in minutes			
			0	15	30	90	180	15	30	90	180
1	5 ml. copper sulfate solution	4.6	7.16	------	5.58	4.10	2.59	------	77.9	57.3	36.2
2	5 ml. copper nitrate solution (10 percent).	4.5	7.68	------	6.55	5.13	3.47	------	85.3	66.8	45.2
3	1.4 ml. concentrated, H_2SO_4 +2.5 ml. sodium azide solution.	<1.6	6.88	------	6.23	6.17	5.77	------	90.6	89.7	83.9
4	5 ml. $MnSO_4$ and sulfamic acid+2.5 sodium azide.	3.1	7.28	------	6.66	6.35	6.05	------	91.5	87.2	83.1
5	4 ml. sulfamic acid+2.5 sodium azide.	4.4	[1] 7.30	------	6.81	6.11	5.35	------	93.3	83.7	73.3
6 [3]	0.5 ml. dilute acetic+2.5 sodium azide.	4.5	7.41	------	6.72	6.16	4.93	------	90.7	83.1	66.5
7	2.5 ml. copper sulfate+0.5 ml. dilute acetic+4 ml. sulfamic.	3.4	7.57	------	6.81	6.12	5.64	------	90.0	80.8	74.5
8 [4]	0.5 ml. dilute acetic+4 ml. sulfamic.	4.0	6.26	------	5.23	[1] 3.59	[1] 2.11	------	83.0	57.3	33.7
9 [5]	0.5 ml. dilute acetic+4 ml. sulfamic+2.5 ml. sodium azide.	4.1	[1] 6.67	------	6.10	5.43	4.72	------	91.5	81.4	70.8
10	2.5 ml. sodium azide	6.8	[1] 5.45	------	0.71	0.00	0.00	------	13.0	0.00	------
11	10 ml. sodium azide	6.8	[1] 4.99	4.00	[1] 2.64	[2] 0.31	------	80.2	52.9	[2] 6.2	------
Control	For Nos. 1 to 5 untreated	6.8	7.30	2.59	------	------	------	35.5	------	------	------
Control	For Nos. 6 to 11 untreated	6.8	7.41	2.92	------	------	------	39.4	------	------	------

[1] Determinations in which the duplicates varied more than 0.3 parts per million.
[2] 60-minute observation.
[3] Sludge settled poorly.
[4] Excellent settling.
[5] Good settling.

The copper salts used were not as effective in stopping oxidation as the combinations of reagents used in later experiments. Copper acetate was also tried and, whereas it gave a good settling sludge, its effectiveness in arresting respiration was of the same order as the

466855°—42——2

sulfate and nitrate. The concentration of copper used in these experiments is undesirable because it prevents the complete destruction of nitrites by the azide treatment. It also prevents obtaining an easily recognized sharp end point in the titration using starch as an indicator. As the copper salts are not as effective in stopping oxidation as other reagents, cause poor end points in titrations, and do not permit the effective use of azide for nitrite destruction, their use for preliminary treatment seems undesirable.

The results of the third series of experiments (table 3) show again that sulfuric acid and azide treatment, which lowers the sludge pH to 1.6, is very effective in stopping oxygen utilization by the sludge. The initial dissolved oxygen data in this series of experiments are not entirely comparable, because the experiments were performed on 2 days and there was a variation in aeration rate, especially in experiments 6 to 11. However, the results of these experiments indicate again that treatment with sulfuric acid and azide to lower the pH to 1.6 results in a lower initial dissolved oxygen as it would be expected that the initial dissolved oxygen found here would be between the values found in experiments 2 and 4.

The most effective combinations in stopping biochemical oxidation, in addition to those shown for series 3, were found in experiments 4, 5, 6, and 9. It will be noticed that in all these sodium azide was used and the pH of the sludge resulting from the treatment was between 3.1 and 4.5. However, it was found that the introduction of sodium azide in any of these combinations resulted in the generation of some gaseous hydrogen azide, HN_3. The release of this poisonous gas into the atmosphere while the bottles were being filled was sufficient to produce immediate severe headache in all persons who participated in the experiments.

Although the azide treatment in any of these combinations was very desirable in preventing oxygen absorption, it was considered too hazardous for practical use.

The result of experiment 7 showed that a reduction in the amount of copper sulfate to one-half that used in experiment 1 with the addition of acetic acid and sulfamic acid was also very effective in reducing oxygen absorption. Upon the basis of dissolved oxygen depletion in 30 minutes, this treatment was almost twice as effective as copper sulfate alone. Experiment 8 indicates the possibility of using acetic acid and sulfamic acid together for decreasing oxygen absorption.

A number of experiments were, therefore, carried out using a 30-minute time for reaction with slight variations of the sludge treatment given in experiments 7 and 8. The dissolved oxygen initially and after 30 minutes was also determined upon similar sludge samples by the method used in experiment 9 (table 3), employing acetic and sulfamic acids and azide as a standard. The mean results obtained, employing the technique already described on duplicate portions in every case, are shown in table 4. These data indicate that procedures 7 and 9, shown in table 3, are about equally effective in preventing biochemical oxidation for a 30-minute period. Treatment with sulfamic acid and acetic acid was not quite as effective as the other two combinations. However, even this treatment is more effective in stopping oxidation than the original copper sulfate treatment. In addition, it destroys any nitrite present in the sludge which copper sulfate, of course, does not do.

TABLE 4.—*Comparison of oxygen depletion after 30 minutes in activated sludge mixtures treated by promising methods to reduce biochemical oxidation*

[Temperature of sludge in these tests 25° to 28° C.]

Treatment used to stop biochemical oxidation. (Reagents added to a 500 ml. bottle)	Sample	pH resulting from treatment	Dissolved oxygen, parts per million		Depletion in 30 minutes, parts per million
			Initial	After 30 minutes	
4 ml. sulfamic+0.5 ml. dilute acetic+2.5 ml. sodium azide. (This treatment No. 9 from table 3 was used as a standard of comparison)	1	4.2	6.11	5.34	0.77
	2	4.1	2.35	1.87	.48
	3	4.4	5.10	4.39	.71
	4	4.2	5.81	5.25	.56
Mean					.63
5 ml. of 5 percent Cu $(C_2H_3O_2)_2$+8 ml. sulfamic+0.5 ml. dilute acetic. (This treatment was similar to No. 7 of table 3 except that 10 percent copper acetate solution was substituted for copper sulfate)	1 [1]	2.9	6.42	5.58	.84
	2	4.2	2.51	2.11	.40
	2a	4.2	2.59	2.08	.51
	3	4.3	5.89	5.18	.71
	3a	4.4	5.55	5.03	.52
Mean					.59
8 ml. sulfamic+0.5 ml. dilute acetic	1	3.0	6.12	5.11	1.01
8 ml. sulfamic+0.5 ml. dilute acetic	1a	3.0	6.21	5.24	.97
8 ml. sulfamic+0.5 ml. dilute acetic	2	2.7	2.40	1.74	.66
8 ml. sulfamic+0.5 ml. dilute acetic	3	2.6	5.34	4.47	.87
4 ml. sulfamic+1.0 ml. dilute acetic	4	3.5	5.85	5.20	.65
8 ml. sulfamic+0.5 ml. dilute acetic	4a	2.8	5.87	5.21	.66
8 ml. sulfamic+1.0 ml. dilute acetic (Treatment No. 8 of table 3).	4b	2.8	5.81	5.15	.66
Mean					.78

[1] In this sample $CuSO_4$ was used as in No. 9 of table 3.

In actual practice in determining dissolved oxygen in sludge liquors, the sludge is not kept in contact with the supernatant, as was done in the previous experiments, but is allowed to settle immediately after it is collected and mixed with the respiratory inhibitor. Consequently, a few additional experiments were carried out in this manner, the dissolved oxygen being determined on the supernatant after 5 minutes of settling and again after a 30-minute period. The data shown in table 5 indicate that is it immaterial which copper salt is used with sulfamic and acetic acid. In the six tests made the dissolved oxygen depletion in 30 minutes varied from 0.02 to 0.17 p. p. m. With sulfamic and acetic acid together, but no copper salt, a depletion of 0.34 p. p. m. of oxygen was obtained in 30 minutes on one of these samples.

On the basis of the foregoing experiments, it is concluded that a combination of copper sulfate, sulfamic acid, and acetic acid is most effective and desirable for arresting respiration in activated sludge when all factors are considered. It is realized that many other combinations of reagents may be used satisfactorily for this purpose, if care is taken to remove and analyze the supernatant as soon as possible after collection and contact with the inhibitors. Any one of the reagents in this combination could even be used alone, but this combination of the three is superior to any of the individual reagents or to any pair of reagents for treating activated sludge in determining dissolved oxygen. It has been demonstrated that when a sludge is collected in contact with these reagents, mixed, and allowed to settle for 30 minutes a higher dissolved oxygen will be obtained than from the same sludge sample from which the solids are removed mechanically as rapidly as possible by centrifuging. This demonstrates that it is extremely important to arrest the respiration instantly with the collection of the sludge sample.

TABLE 5.—*Comparison of supernatant dissolved oxygen results in sludge treated with respiratory inhibitors after 5 and 30 minutes of settling*

[Temperature of sludge in these tests 24° to 25° C.]

Treatment used to stop biochemical oxidation	Sample No.	pH resulting from treatment	Dissolved oxygen in supernatant, parts per million		Depletion of supernatant in 30 minutes, parts per million
			Initially	After 30 minutes	
Modification of No. 7 of table 3, acetic and sulfamic as in No. 7:					
A+2.5 ml. $CuSO_4$	1	2.9	6.84	6.78	0.06
	2	3.4	2.64	2.54	.10
B+2.5 ml. $Cu(NO_3)_2$	1	3.0	6.82	6.80	.02
	2	3.2	2.66	2.49	.17
C+5 ml. 5 percent $Cu(C_2H_3O_2)_2$	1	4.2	6.80	6.69	.11
	2	3.4	2.68	2.65	.03
No. 8 of table 3: 8 ml. sulfamic, 0.5 ml. dilute acetic	1	3.0	6.60	6.51	.09
	2	4.4	2.47	2.13	.34
	3		6.14	6.14	.00

One series of experiments was carried out to determine the effectiveness of the respiration-inhibiting reagents in eliminating nitrites during the sludge treatment. To follow this reaction satisfactorily quantities of nitrite were added to the sludge, after which the sludge was siphoned in the manner described previously, into 500 ml. bottles containing the reagents. After mixing, the bottles were allowed to stand, the nitrites being determined in the supernatant after 15 and 30 minutes. The results obtained, shown in table 6, indicate that the acetic acid sodium azide treatment was not very effective in eliminating nitrites in sludge liquors. This confirms the work of Brandt (*16*). When sulfamic acid was added to the above two reagents, the nitrite destruction reaction rate was increased. Treatment with sulfamic acid and acetic acid, and this combination with copper sulfate, was most effective in destroying nitrites in activated sludge liquors.

TABLE 6.—*Nitrite destruction in activated sludge liquors by respiration inhibiting reagents*

Treatment used on activated sludge sample. (Reagents added to a 500 ml. bottle)	Initial NO_2 added to activated sludge, parts per million N	NO_2 recovered after indicated time in minutes, parts per million N	
		15	30
0.5 ml. dilute acetic+2.5 ml. sodium azide solution	12	9.0	5.0
	24	22.0	18.0
	36	28.0	28.0
4 ml. sulfamic+0.5 ml. dilute acetic+2.5 ml. sodium azide solution	12	4.0	2.0
	24	9.0	5.2
	36	12.0	6.0
8 ml. sulfamic+0.5 ml. dilute acetic	12	.2	None
	24	.8	None
	36	1.2	.1
2.5 ml. $CuSO_4$ solution +8 ml. sulfamic +0.5 ml. dilute acetic	12	None	None
	24	.3	None
	36	1.0	.06
5 ml. $CuSO_4$ solution	12	12.0	12.0
	24	24.0	24.0
	36	28.0	28.0

PROPERTIES OF SULFAMIC ACID

As sulfamic acid (NH_2SO_2OH) has not been used in sewage analysis heretofore, its properties will be briefly reviewed from Audrieth, et al. (*17*). It is a crystalline, nonhygroscopic solid, melting with decomposition at 205° C. Its solubility in 100 grams of water varies from 14.69 at 0° C. to 47.08 at 80° C., and is decreased by the presence of sulfuric acids. Sulfamic acid is highly ionized in aqueous solution and is of relatively the same strength as hydrochloric, nitric, and sulfuric acids. This acid has been recommended as a primary standard in acidimetry and can be titrated using indicators whose transition points lie within the pH range of 4.5 to 9.0.

Solutions of sulfamic acid are rapidly decomposed by the addition of nitrite:

$$NH_2SO_2OH + NaNO_2 \xrightarrow{H+} NaHSO_4 + N_2 + H_2O$$

This reaction takes place quantitatively and may, therefore, be used for qualitative or quantitative determination of either sulfamic acid or nitrite. In the reagent suggested for inhibiting respiration in sludge, the sulfamic acid reacts with any nitrite present in accordance with the above reaction with the liberation of nitrogen gas. Neither the sulfamic acid nor the products formed by it interfere in any way with the subsequent determination of dissolved oxygen. Sulfamic acid, however, does react with oxides, hydroxides, and carbonates to form sulfamates. As most sulfamates are soluble in water, the formation of copper, manganese, or sodium sulfamates in the process of sludge treatment or dissolved oxygen determination does not introduce any difficulty.

The sulfamic acid can, however, be oxidized or hydrolyzed and this would make the inhibiting reagent worthless as far as nitrite destruction is concerned. In the cold chlorine, bromine and chlorates oxidize sulfamic acid to sulfuric acid, but potassium permanganate, chromic acid, and ferric chloride exert no oxidizing action. Under the same conditions as those existing during the dissolved oxygen determination, iodine exerts no apparent oxidizing action on sulfamic acid.

Hydrolysis of sulfamic acid (that is conversion from an ammonosulfuric acid into an aquosulfuric acid) takes place in accordance with the following reaction:

$$NH_2SO_2OH + HOH \longrightarrow H_2SO_4 + NH_3 \text{ (or } NH_4HSO_4)$$

This reaction takes place very slowly at ordinary temperatures for, according to Audrieth et al. (*17*), no appreciable concentration of sulfate ion could be detected until after several weeks. At higher temperatures the hydrolysis becomes quite rapid, 40 percent of a 10 percent solution being hydrolyzed in 6 hours at 80° C. according to Cupery (*18*). In view of this rapid hydrolysis caution in heating to obtain solution of sulfamic acid and copper sulfate in the preparation of the inhibiting reagent is advised. To what extent hydrolysis of the sulfamic acid takes place in this reagent at ordinary temperatures is unknown at present. It has been found that the reagent has maintained its effectiveness in the destruction of nitrites for 45 days after preparation. The efficiency of the mixed reagent as a respiratory inhibitor in activated sludge would be but slightly affected, if at all, by hydrolysis of the sulfamic acid due to the continued activity of its other constituents.

PREPARATION OF THE INHIBITORY REAGENT

The inhibitory reagent is prepared in the following manner: Fifty gm. of copper sulfate are dissolved in 500 ml. of distilled water. Thirty-two gm. of sulfamic acid are then dissolved in 475 ml. of water and the two solutions, together with 25 ml. of glacial acetic acid are mixed. Solution of the sulfamic acid may be slow but can be accomplished by stirring. Heat should not be used to facilitate solution nor should the mixture be exposed to beat at any subsequent time as this hastens the hydrolysis of sulfamic acid. The technical grade sulfamic acid may give a slight turbidity. This turbidity may be disregarded as it does not affect the efficiency of the reagent, or it may be removed by filtration. Five ml. of this reagent correspond to the 2.5 ml. of 10 percent copper sulfate, 0.5 ml. of 1:4 acetic acid, and 8 ml. of 2 percent sulfamic acid as used in 500 ml. bottles in the experimental work. In general, 1 ml. of the inhibitory reagent is used for each 100 ml. portion of sample.

RECOMMENDED PROCEDURE FOR DETERMINING DISSOLVED OXYGEN

In practice, 10 ml. of the inhibitory reagent are added to a 1-liter bottle. The sample of mixed liquor is siphoned or allowed to flow into the bottle to overflowing, with reasonable caution to avoid aeration, the stopper inserted, and the bottle inverted several times to mix the contents. The sludge is allowed to settle for 5 or 10 minutes, or until the sludge has settled sufficiently to permit siphoning the supernatant into a 300-ml. bottle without obtaining sludge solids. If the sludge is bulking badly a period of 30 to 40 minutes may be allowed for the sludge to settle. There will be no appreciable loss of oxygen within this time provided continuous agitation is avoided. The agitation incidental to transportation of the mixed liquor sample containing the inhibiting reagent from a collection point to a laboratory within easy walking distance should not be detrimental. The dissolved oxygen is determined on the supernatant in the 300-ml. bottle by the short Winkler technique. Two ml. of the standard manganous sulfate and 3 ml. of alkaline iodide containing sodium azide [4] are added and the sample is shaken for 30 seconds. Two ml. of concentrated sulfuric acid are added and the sample is shaken. If it is desired to titrate 200 ml. of the original sample, 203.4 ml. are measured out and titrated with standard N/40 thiosulfate solution.

SUMMARY

An inhibiting reagent composed of sulfamic acid, acetic acid, and copper sulfate is proposed. This reagent is about twice as effective as copper sulfate used alone, though it contains only one-half the original concentration of this salt and consequently does not interfere with the end point in the iodine titration. When activated sludge is brought into contact with this reagent, oxygen absorption is stopped, nitrites are destroyed, and the sludge is coagulated. The dissolved oxygen may then be determined upon the separated supernatant by the application of the short Winkler procedure employing sodium azide in the alkaline iodide solution. The determination of dissolved oxygen in activated sludge mixtures by this procedure is simple and dependable and has been found especially valuable in actual operating practice.

---

[4] The standard alkaline iodide solution containing 8 gm. of sodium azide per liter.

REFERENCES

(*1*) Theriault, E. J., and McNamee, P. D.: Apparatus for determination of dissolved oxygen in sludge. Sewage Works J., **6**: 413–422 (1934).
(*2*) Klassen, C. W.: The value of laboratory tests for the control of the activated sludge process. Sewage Works J., **8**: 673–676 (1936).
(*3*) Anderson, C. George: Sewage Works J., **8**: 784 (1936).
(*4*) Heukelekian, H.: Dissolved oxygen. Its determination and importance in the activated sludge process. Water Works and Sewerage, **85**: 715–719 (1938).
(*5*) Poindexter, G. G.: Operating problems in starting the southwest plant of the Sanitary District of Chicago (chemical control). Sewage Works J., **11**: 1025 (1939).
(*6*) Küchler: Apparatus for the determination of oxygen in slime-containing sewage. Chem. Zeit., **54**: 184 (1930).
(*7*) Konstantinowa, E. F.: Determination of dissolved oxygen in the presence of activated sludge. Trav. comm. recherches epurat. eaux egout (Moscow), No. 2, 110 (1930); Dep. Sci. Ind. Research, Water Pollution Research, **4**: 97–98 (1931).
(*8*) Goldthorpe, H. H.: Some experiments on the oxygen demand of an activated sludge. The Surveyor, **89**: 351–53 and 379–80 (1936).
(*9*) Watson, W.: Discussion of the Northeastern Branch Meeting of The Institute of Sewage Purification. The Surveyor, **89**: 13 (1936).
(*10*) Kessler, Lewis H., and Nichols, M. Starr: Oxygen utilization by activated sewage sludge. Sewage Works J., **7**: 810–838 (1935).
(*11*) Theriault, E. J., and McNamee, P. D.: Dissolved oxygen in the presence of organic matter, hypochlorites and sulfite wastes. Ind. and Eng. Chem., Anal. Ed., **4**: 59–64 (1932).
(*12*) Placak, O. R., and Ruchhoft, C. C.: Determination of biochemical oxygen demand. Comparative study of the azide and Rideal-Stewart modification of the Winkler method. Ind. and Eng. Chem., Anal. Ed., **13**:12 (1941).
(*13*) Ruchhoft, C. C., Moore, W. Allan, and Placak, O. R.: Determination of dissolved oxygen. Rideal-Stewart and Alsterberg modifications of the Winkler method. Ind. and Eng. Chem., Anal. Ed., **10**: 701–703 (1938).
(*14*) Barnett, G. R., and Hurwitz, E.: The use of sodium azide in the Winkler method for the determination of dissolved oxygen. Sewage Works J., **11**: 781 (1939).
(15) Cohen, Stuart, and Ruchhoft, C. C.: Salfamic acid modification of the Winkler method for dissolved oxygen. Ind. and Eng. Chem., Anal. Ed., **13**: 622 (1:41).
(*16*) Brandt, H. J.: The determination of oxygen in water in the presence of nitrite. Gesund-Ing., **60**: 557–9 (1937).
(*17*) Audrieth, L. F., Sveda, M., Sisler, H. H., and Butler, M. Josetta: Sulfamic acid, sulfamide and related aquo-ammonsulfuric acids. Chem. Reviews, **26**: 49–94 (1940).
(*18*) Cupery, M. E.: Sulfamic acid, a new industrial chemical. Ind. and Eng. Chem., **30**: 627–631 (1938).

PROVISIONAL MORTALITY RATES FOR THE FIRST QUARTER OF 1942

The mortality rates in this report are based upon preliminary data from 27 States, the District of Columbia, Alaska, and Hawaii for the first 3 months of 1942. Comparative data for 26 States and the District of Columbia are presented also for the first 3 months of 1940 and 1941.

This report is made possible through a cooperative arrangement with the respective States, which voluntarily furnish provisional monthly tabulations of current birth and death statistics to the United States

Public Health Service, which analyzes and publishes the data. Because of lack of uniformity in the method of classifying deaths according to cause, as well as some delay in filing certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.

In the past, however, these preliminary reports have accurately reflected the trend in mortality rates for the country as a whole. Some deviation from the final figures, especially those for specific causes of death, for individual States may be expected because of the provisional nature of the information. Nevertheless, it is believed that the trend in mortality within each State is correctly represented. Comparisons of specific causes of death for different States are subject to error because of variations in tabulation procedure and promptness of filing the original certificates. Such comparisons should be based upon the final figures published by the Bureau of the Census.

The mortality rate from all causes during the first 3 months of 1942 was nearly 8 percent less than the corresponding rate for 1941 and 10 percent less than the rate for 1940. The decrease in the death rate was widespread; only 4 of the 27 States for which data are available reported a higher rate in 1942 than in 1941.

This decrease in the mortality rate was made possible by a decrease in the death rate from every important cause except cancer. However, about one-half of the decrease resulted from the unusually low death rates from influenza and pneumonia. Each of the 27 States reported that the death rate for influenza was lower than the rate for last year, while 24 States reported a lower death rate for pneumonia.

The only diseases, other than cancer, with a higher death rate in 1942 are measles and diarrhea and enteritis, each of which is relatively unimportant as a cause of death.

The death rate for automobile accidents dropped from 22.9 per 100,000 in 1941 to 21.8 in 1942, a decrease of about 5 percent. A further decrease in the number of fatal automobile accidents can be expected during the remaining months of 1942, due to gasoline rationing and the difficulty of replacing worn-out tires.

The birth rate continued to increase; the rate for the current quarter is about 5 percent higher than the rate for the first quarter of 1941, and nearly 12 percent higher than the rate for the first quarter of 1940.

466855°—42——3

Provisional mortality from certain causes in the first 3 months of 1942, with comparative provisional data for the corresponding period in preceding years

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Dysentery (27)	Diarrhea and enteritis under 2 years (119)	Scarlet fever (8)	Diphtheria (10)	Whooping cough (9)	Measles (35)	Cerebrospinal (meningococcus) meningitis (6)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Tuberculosis, all forms (13-22)	Syphilis (30)	Influenza (grippe) (33)	Pneumonia, all forms (107-109)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
27 States: [1]																									
1942	11.0	18.3	49	2.8	0.3	0.4	3.5	0.4	0.8	2.1	1.7	0.7	0.2	0.4	44.2	12.2	16.3	67	119	28.3	97	322	79	65	21.8
1941	11.9	17.5	53	3.0	.5	(2)	3.4	.4	.8	3.2	1.6	.7	.3	.6	47.4	(3)	47.7	81	116	31.1	99	337	86	68	22.9
1940	12.2	16.4	54	4.2	.5	(2)	3.4	.8	1.3	2.1	.5	.8	.3	.6	48.0	(3)	37.5	90	118	31.4	105	337	92	67	18.9
Industrial policyholders: [3]																									
1942	8.1	----	----	----	.1	----	[4] 3.6	.6	.6	1.0	.6	----	----	----	42.6	10.2	7.3	42	103	30.0	66	[5] 175	[6] 56	51	20.2
1941	8.5	----	----	----	.5	----	[4] 3.3	.6	.7	1.5	.8	----	----	----	45.3	11.6	20.8	51	107	33.5	68	[5] 185	[6] 60	47	19.8
1940	8.5	----	----	----	.5	----	[4] 3.7	.8	1.2	1.5	.4	----	----	----	45.6	12.0	16.5	57	105	33.3	67	[5] 182	[6] 64	44	15.7
Alaska:																									
1942	16.2	26.5	107	2.0	(7)	(7)	10.7	(7)	5.3	16.0	5.3	(7)	(7)	(7)	239.8	(7)	26.6	112	91	16.0	59	213	37	256	10.7
1941	21.0	29.2	132	7.2	5.4	(2)	(7)	(7)	(7)	21.7	162.6	(7)	5.4	(7)	498.5	(3)	113.8	146	81	5.4	81	206	43	146	(7)
1940	19.0	23.4	175	(7)	(7)	(3)	10.9	(7)	(7)	76.6	136.8	(7)	(7)	(7)	404.8	(3)	16.4	164	82	(7)	71	181	11	142	(7)
Connecticut:																									
1942	9.7	14.8	32	3.0	(7)	(7)	3.0	(7)	(7)	.2	.2	.5	(7)	(7)	34.4	7.0	3.0	32	125	34.6	88	334	66	53	15.9
1941	10.2	11.6	41	4.3	.5	(3)	2.1	.5	(7)	.2	.2	.5	.2	(7)	31.3	(3)	14.4	50	134	40.5	91	367	80	53	15.3
1940	11.6	14.0	38	3.0	(7)	(3)	1.6	(7)	.2	.7	.5	.5	(7)	(7)	36.2	(3)	8.2	74	157	21.1	125	369	71	54	15.5
Delaware:																									
1942	13.0	18.6	38	(7)	(7)	(7)	4.4	3.0	(7)	(7)	(7)	(7)	(7)	(7)	57.8	5.9	11.9	95	119	20.8	135	454	125	65	17.8
1941	14.1	19.2	49	(7)	(7)	(3)	4.5	3.0	(7)	7.5	1.5	(7)	(7)	(7)	58.5	(3)	36.0	102	116	22.5	126	443	162	62	24.0
1940	13.4	16.2	55	3.7	(7)	(3)	3.0	3.0	(7)	3.0	(7)	1.5	(7)	(7)	46.7	(3)	33.1	92	154	46.7	117	426	134	38	12.0
District of Columbia:																									
1942	11.1	24.4	41	2.2	(7)	(7)	10.1	(7)	(7)	4.8	(7)	1.4	(7)	(7)	58.2	21.7	6.3	82	125	25.5	78	304	102	67	20.7
1941	12.9	23.7	46	3.7	.5	(3)	7.1	(7)	1.1	1.6	.5	1.6	.5	(7)	59.1	(3)	12.6	116	151	29.6	85	339	105	71	21.9
1940	14.2	21.1	48	2.0	(7)	(3)	5.3	.6	.6	3.0	(7)	.6	.6	(7)	62.4	(3)	20.2	130	144	39.2	97	405	136	62	16.0
Florida:																									
1942	12.5	18.7	59	3.7	2.0	2.4	7.2	.2	2.6	1.6	5.2	1.2	(7)	.2	46.6	17.6	26.4	73	98	22.6	125	322	75	96	35.0
1941	14.7	18.1	57	5.3	1.2	(3)	5.4	(7)	1.0	2.1	.2	1.2	1.9	.6	51.0	(3)	76.2	76	102	29.6	147	392	105	144	45.9
1940	14.9	16.1	60	6.9	.6	(3)	5.0	.2	1.3	1.7	.4	.4	.2	.4	54.1	(3)	69.0	91	106	27.8	140	398	108	107	41.4

Georgia:																									
1942	8.8	19.1	67	3.2	.3	1.1	2.8	.1	1.5	1.9	4.5	.5	.3	.1	35.7	13.0	29.1	75	56	12.0	89	157	92	57	20.9
1941	10.4	18.7	71	3.2	.5	(2)	3.5	.4	1.4	3.9	2.8	.5	.6	(7)	40.9	(2)	91.8	79	58	15.6	99	201	98	65	27.0
1940	10.8	17.9	68	5.7	.5	(2)	2.3	.8	2.2	1.9	.6	.4	.3	(7)	45.6	(2)	76.0	105	60	12.5	104	203	98	62	19.0
Hawaii:																									
1942	7.2	23.5	43	1.2	2.8	(7)	6.5	(7)	(7)	5.6	(7)	.9	(7)	(7)	41.8	7.4	4.6	61	78	13.0	33	144	67	53	19.5
1941	7.5	22.0	55	1.7	.9	(2)	10.4	(7)	(7)	1.9	3.8	(7)	.9	.9	53.8	(2)	3.8	56	88	12.3	55	136	59	57	16.0
1940	7.8	22.1	55	1.7	3.8	(2)	5.7	(7)	2.9	3.8	(7)	1.0	1.9	(7)	75.1	(2)	5.7	54	67	16.2	50	133	68	48	8.6
Idaho:																									
1942	9.1	20.6	41	1.4	.7	(7)	(7)	(7)	.7	.7	.7	(7)	(7)	.7	16.4	2.2	12.7	52	68	17.2	96	264	58	74	17.2
1941	8.6	22.0	43	1.4	.8	(2)	1.5	(7)	(7)	6.1	(7)	1.5	(7)	2.3	7.6	(2)	28.0	47	83	20.5	81	224	58	73	18.2
1940	9.3	21.5	38	5.0	(6)	(2)	2.3	2.3	.8	(7)	1.5	3.1	(7)	.8	16.0	(2)	24.4	53	85	17.6	60	250	64	70	18.3
Indiana:																									
1942	11.5	18.2	38	3.7	.2	.2	2.3	.5	.7	1.2	.2	(7)	.4	.6	40.4	10.5	29.2	73	123	12.5	144	283	82	73	30.6
1941	12.4	16.7	48	2.9	.5	(2)	1.6	.7	1.9	2.0	.9	.7	.2	.1	38.9	(2)	54.0	87	123	15.8	146	311	73	83	36.2
1940	13.1	16.3	46	3.3	.6	(2)	2.6	2.3	1.4	2.8	.1	.2	.2	.7	40.2	(2)	50.8	99	124	19.3	166	368	94	72	27.4
Iowa:																									
1942	9.9	16.7	40	3.1	(7)	.2	2.1	.2	.2	1.4	1.3	(7)	.2	.5	14.0	6.0	13.8	51	136	24.1	114	297	58	63	17.3
1941	10.7	18.0	39	3.1	.3	(2)	1.1	.5	.3	1.1	.8	.3	(7)	.2	14.0	(2)	35.0	76	131	30.2	112	315	65	54	17.7
1940	11.9	16.5	43	3.0	.5	(2)	1.7	.6	.9	.5	.6	.5	.5	1.6	16.1	(2)	42.4	80	143	31.7	128	337	78	69	19.3
Kansas:																									
1942	11.2	18.1	38	2.0	(7)	(7)	2.9	.9	(7)	.4	1.3	.2	.2	1.3	24.4	10.3	29.8	50	127	31.4	127	328	96	72	21.5
1941	11.9	16.6	47	2.7	(7)	(2)	2.5	.2	.4	4.7	2.5	1.3	(7)	1.1	25.6	(2)	58.5	67	120	30.9	111	332	116	71	26.9
1940	11.6	14.3	45	4.4	(7)	(2)	2.0	9	1.1	1.6	2.0	1.1	(7)	.7	24.2	(2)	45.4	59	125	31.6	112	310	113	71	18.7
Kentucky:																									
1942	10.2	(2)	(2)	(2)	.8	1.5	3.4	1.4	2.5	4.9	1.4	1.3	.6	.1	61.1	8.8	30.9	91	80	14.8	95	247	83	75	16.5
1941	11.6	17.8	71	5.2	1.0	(2)	3.5	1.1	1.0	9.6	6.1	1.8	1.0	.1	75.4	(2)	115.9	104	81	21.1	110	241	83	64	22.4
1940	11.5	18.6	66	5.4	.8	(2)	4.2	.8	1.8	4.1	1.1	.8	1.3	.4	73.2	(2)	63.6	106	79	16.2	118	240	76	74	17.9
Louisiana:																									
1942	10.2	21.1	58	3.2	1.3	.8	6.7	(7)	2.7	1.8	1.5	1.2	.3	.5	49.3	23.2	25.9	71	89	18.2	72	258	79	59	18.4
1941	11.6	21.9	69	3.7	2.9	(2)	6.4	.5	1.9	2.7	.2	1.0	.5	(7)	62.4	(2)	77.3	94	85	20.0	78	291	94	65	21.6
1940	13.7	20.0	74	6.3	2.0	(2)	6.6	.2	2.5	6.3	.8	.5	.7	.2	64.1	(2)	84.1	139	85	24.1	81	313	112	77	20.2
Maine:																									
1942	13.1	20.0	46	1.9	.5	(7)	6.1	.9	(7)	.9	3.8	1.4	(7)	.9	28.8	8.5	18.4	64	149	35.9	140	383	86	69	22.7
1941	14.5	16.8	62	2.3	(7)	(2)	4.7	.5	(7)	2.4	.5	.9	.5	.9	34.7	(2)	59.8	102	159	39.9	133	402	115	73	21.8
1940	13.0	16.7	57	5.7	.5	(2)	7.6	1.9	1.4	2.4	1.4	1.9	(7)	.5	25.6	(2)	22.7	73	135	34.6	136	395	89	65	19.9
Maryland:																									
1942	12.9	18.9	50	2.2	.2	(7)	4.6	.4	.4	.7	1.3	2.8	(7)	.7	73.9	19.3	8.9	92	140	33.5	108	390	130	74	29.1
1941	13.6	17.9	54	1.8	.4	(2)	5.9	.2	(7)	5.3	(7)	1.3	.2	(7)	78.0	(2)	27.5	98	148	38.4	104	409	136	81	28.8
1940	14.7	16.8	58	3.7	.7	(2)	2.9	.7	.7	3.7	.2	.4	.4	.2	90.7	(2)	22.7	117	139	41.0	118	422	172	73	18.9
Montana:																									
1942	9.9	18.4	48	3.1	(7)	(7)	2.2	.7	2.2	2.2	(7)	.7	(7)	.7	38.0	13.6	8.6	53	103	10.0	100	272	59	67	21.5
1941	10.6	19.9	46	2.2	.7	(2)	2.2	1.4	2.9	(7)	(7)	1.4	(7)	(7)	48.3	(2)	49.7	67	100	14.4	100	253	56	81	29.5
1940	10.2	19.8	39	4.3	(7)	(2)	3.6	3.6	.7	1.4	2.9	1.4	(7)	.7	43.8	(2)	20.8	63	114	7.9	98	228	65	66	19.4
Nebraska:																									
1942	9.5	16.9	37	2.2	(7)	.3	.9	.3	.6	.9	.3	.3	.3	.6	12.4	8.7	17.7	40	129	28.2	91	277	65	55	13.9
1941	10.7	16.7	44	2.8	.3	(2)	.9	(7)	(7)	1.9	(7)	.9	.9	.3	16.7	(2)	68.5	68	131	27.3	126	254	73	51	14.9
1940	10.8	16.4	39	2.4	(7)	(2)	.9	1.5	.9	(7)	.3	.9	(7)	(7)	19.9	(2)	38.2	74	134	35.2	129	272	60	56	14.1

ee footnotes at end of table.

Provisional mortality from certain causes in the first 3 months of 1942, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Dysentery (27)	Diarrhea and enteritis under 2 years (119)	Scarlet fever (8)	Diphtheria (10)	Whooping cough (9)	Measles (35)	Cerebrospinal (meningococcus) meningitis (6)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Tuberculosis, all forms (13-22)	Syphilis (30)	Influenza (grippe) (33)	Pneumonia, all forms (107-109)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
Nevada:																									
1942	16.0	19.1	48	(7)	(7)	(7)	(7)	(7)	(7)	10.6	(7)	(7)	(7)	3.5	81.3	10.6	10.6	50	141	14.1	113	435	74	325	99.0
1941	11.8	17.2	44	4.2	7.2	(2)	(7)	(7)	(7)	3.6	(7)	(7)	(7)	(7)	50.4	(2)	21.6	65	126	14.4	65	317	58	169	79.2
1940	12.1	18.7	39	5.8	(7)	(2)	(7)	(7)	(7)	(7)	(7)	3.6	3.6	(7)	40.0	(2)	10.9	124	109	18.2	80	273	58	124	40.0
New Mexico:																									
1942	10.3	25.3	102	1.7	.7	4.4	10.9	(7)	2.2	13.1	10.9	.7	(7)	.7	61.2	12.4	28.4	107	47	7.3	37	149	52	68	32.0
1941	11.1	26.7	99	3.1	3.0	(2)	8.9	(7)	3.0	11.9	17.8	(7)	(7)	(7)	71.3	(2)	42.4	87	60	12.6	38	135	51	86	39.4
1940	11.3	33.6	76	3.6	2.3	(2)	7.5	(7)	.8	6.8	(7)	(7)	(7)	(7)	73.0	(2)	27.1	81	51	11.3	53	123	54	84	34.6
New York:																									
1942	11.6	16.2	34	2.2	.1	.1	2.9	.2	.1	.8	.1	.8	.1	.9	47.4	14.9	3.1	54	168	42.4	78	427	63	59	16.0
1941	12.4	14.6	38	2.1	.1	(2)	2.8	.5	(8)	.9	.5	.6	(8)	1.3	48.6	(2)	10.9	70	158	46.6	81	454	69	56	14.8
1940	12.2	14.0	39	3.4	.1	(2)	2.9	.5	.1	1.3	.2	.3	(8)	.9	48.8	(2)	6.3	67	158	45.2	81	436	73	58	14.0
North Carolina:																									
1942	8.8	23.6	63	3.8	.3	.8	5.3	.6	1.1	5.0	3.5	.7	.1	.1	46.7	7.7	16.9	81	56	13.8	87	173	83	68	29.1
1941	10.2	22.7	72	4.8	.6	(2)	3.8	.3	2.7	5.6	1.9	.3	.3	.2	50.5	(2)	75.6	101	59	15.2	86	168	92	74	34.1
1940	10.5	21.4	69	5.8	.7	(2)	5.3	.4	4.7	2.1	.6	.6	.1	.1	52.7	(2)	61.0	102	58	18.0	96	159	110	63	23.4
North Dakota:																									
1942	6.1	16.4	43	3.1	.6	.6	5.7	.6	(7)	1.9	1.9	(7)	(7)	1.3	21.0	1.9	5.7	26	76	17.2	71	157	32	25	8.3
1941	8.0	22.7	46	.6	(7)	(2)	4.5	.6	2.5	1.3	1.3	(7)	(7)	.6	23.5	(2)	21.0	44	85	17.8	71	213	39	49	12.7
1940	8.6	21.3	45	2.1	1.3	(2)	5.0	2.5	2.5	1.9	.6	(7)	(7)	1.9	20.1	(2)	17.6	50	107	28.9	77	209	43	50	13.8
Ohio:																									
1942	11.9	17.5	44	2.3	.2	.1	2.7	.4	.5	2.8	.8	.1	.1	.1	39.5	12.9	16.7	74	135	37.0	113	361	85	82	31.2
1941	12.2	14.7	46	2.5	.2	(2)	3.6	.4	.4	2.9	1.2	.4	.3	.7	42.6	(2)	40.1	73	133	34.6	111	354	80	85	30.5
1940	12.8	15.5	44	3.9	.6	(2)	3.3	1.0	.6	1.9	(7)	.8	.1	.3	43.9	(2)	27.9	88	140	33.5	124	363	88	87	25.5
Oklahoma:																									
1942	12.0	27.0	44	3.6	.7	1.0	2.1	.5	3.7	3.0	11.8	.9	1.0	.9	56.7	8.2	28.2	86	110	21.9	107	255	71	85	23.1
1941	10.2	20.5	58	3.6	.3	(2)	1.9	.5	3.7	4.9	.3	.3	.2	.3	48.0	(2)	71.2	101	81	20.0	87	209	61	59	22.8
1940	10.3	18.5	54	3.5	1.2	(2)	2.9	.5	4.8	1.4	.3	2.1	1.7	.3	50.8	(2)	54.4	108	80	19.6	88	192	64	57	17.2

Pennsylvania:																									
1942	12.0	(2)	(2)	(2)	.2	.1	3.7	.5	.2	1.8	1.0	.3	.2	(8)	39.9	10.7	11.3	60	127	36.7	95	388	96	46	17.6
1941	12.5	18.7	40	2.3	.2	(2)	3.7	.4	.4	1.8	1.0	.3	.2	.5	43.0	(2)	30.3	75	122	40.9	95	410	104	55	15.7
1940	12.8	14.4	54	3.3	.6	(2)	3.9	.9	.8	1.2	.1	1.3	.3	.7	42.5	(2)	27.4	85	125	44.1	97	398	116	54	14.0
Tennessee:																									
1942	9.5	17.1	64	3.6	.4	.4	1.6	.8	.7	2.2	1.9	.5	1.0	.4	70.4	12.6	31.6	87	72	15.9	85	190	63	64	18.7
1941	10.7	15.8	75	3.6	.7	(2)	3.8	.3	1.0	6.6	3.2	1.8	.3	.8	82.2	(2)	92.5	109	76	15.4	80	180	70	54	17.2
1940	11.4	15.5	71	5.9	.3	(2)	2.2	1.0	1.7	2.8	1.1	.7	.1	.3	77.4	(2)	71.1	128	70	19.3	95	226	64	63	13.2
Utah:																									
1942	8.9	26.9	36	1.3	.7	.7	2.9	.7	(7)	(7)	1.4	(7)	(7)	.1	13.7	7.2	15.2	35	93	13.7	57	300	62	66	26.0
1941	8.6	22.7	38	.3	(7)	(2)	6.6	(7)	(7)	1.5	(7)	(7)	(7)	(7)	13.1	(2)	22.6	42	68	21.9	58	288	53	61	23.3
1940	8.9	23.2	41	2.8	(7)	(2)	2.2	2.9	(7)	1.5	2.2	.7	.7	.7	17.5	(2)	23.3	48	90	15.3	66	255	59	65	27.0
Vermont:																									
1942	12.2	18.3	41	3.7	(7)	1.1	4.5	1.1	1.1	2.3	(7)	1.1	(7)	(7)	35.0	5.6	11.3	52	135	29.3	117	365	85	50	14.7
1941	12.9	17.6	51	4.5	(7)	(2)	6.8	(7)	(7)	(7)	(7)	2.3	(7)	(7)	49.6	(2)	44.0	80	156	31.6	138	436	106	61	11.3
1940	11.9	18.5	42	1.8	1.1	(2)	4.5	(7)	(7)	2.2	(7)	1.1	(7)	(7)	41.4	(2)	28.0	94	125	21.3	136	372	87	83	9.0
Virginia:																									
1942	11.5	19.8	70	3.7	.4	.9	4.0	.6	1.8	4.4	1.5	2.4	.1	.6	58.9	18.7	22.1	95	82	20.3	116	274	95	79	28.7
1941	13.1	18.7	87	4.0	.7	(2)	3.4	.3	1.3	9.9	6.6	1.0	.3	(7)	66.3	(2)	85.3	107	83	21.4	117	300	118	87	30.5
1940	12.9	18.0	78	4.6	.6	(2)	4.2	.4	2.5	5.1	.7	1.6	.3	.9	59.2	(2)	65.9	126	79	24.1	116	296	123	78	21.7
Wisconsin:																									
1942	9.7	17.4	35	2.0	.1	(7)	2.5	1.1	.3	.8	.5	(7)	(7)	.5	24.3	5.1	7.6	48	129	29.9	97	312	56	54	19.5
1941	10.2	16.6	44	2.3	.3	(2)	1.4	1.3	.1	1.2	.9	.1	.3	.9	24.6	(2)	25.8	61	134	29.6	96	311	58	56	18.7
1940	10.8	16.0	42	3.8	(7)	(2)	3.1	.8	.4	.5	.6	.4	.1	.4	26.0	(2)	24.6	76	135	31.5	105	325	61	73	18.0

[1] The District of Columbia is included as a State. Estimated population July 1, 1942, 70,979,500. Includes all of the States listed below except Wisconsin.
[2] Data not available.
[3] These data are taken from the April 1942 Statistical Bulletin published by the Metropolitan Life Insurance Co. The rates for 1941 and 1942 are subject to correction as they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.
[4] Classified as diarrhea and enteritis. Age not specified.
[5] Excludes pericarditis, acute endocarditis and acute myocarditis.
[6] Chronic nephritis only.
[7] No deaths reported.
[8] Less than 1/10 of 1 per 100,000 inhabitants

DEATHS DURING WEEK ENDED JULY 4, 1942

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

	Week ended July 4, 1942	Corresponding week, 1941
Data from 87 large cities of the United States:		
Total deaths	7,599	7,711
Average for 3 prior years	7,296	
Total deaths, first 26 weeks of year	223,479	227,278
Deaths per 1,000 population, first 26 weeks of year, annual rate	12.1	12.3
Deaths under 1 year of age	536	438
Average for 3 prior years	439	
Deaths under 1 year of age, first 26 weeks of year	14,374	13,298
Data from industrial insurance companies:		
Policies in force	64,947,038	64,397,986
Number of death claims	10,896	8,913
Death claims per 1,000 policies in force, annual rate	8.7	7.2
Death claims per 1,000 policies, first 26 weeks of year, annual rate	9.7	10.1

PREVALENCE OF DISEASE

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

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 11, 1942

Summary

The incidence of meningococcus meningitis for the current week is twice as high as the 5-year (1937–41) median and above that for any other corresponding week since 1937. Of the current total of 61 cases, 17 occurred in the Middle Atlantic States and 11 each in the New England and South Atlantic States, or approximately 64 percent of the total from these 3 areas.

The number of cases of poliomyelitis reported for the current week (59), is slightly more than half of the 5-year median expectancy (101 cases). The largest number of cases was reported in the West South Central area, where Arkansas reported 12 cases, the same number as reported for the preceding week. Tennessee reported 5 cases and Georgia and Alabama 4 each. No other State reported more than 3 cases.

The incidence of measles dropped below the 5-year median during the week. The number of cases of diphtheria increased from 136 to 164, and of typhoid fever from 166 to 214. Smallpox, with only 9 cases, continues below the incidence for the corresponding week of any other prior year.

Other reports include 2 cases of anthrax (1 each in Delaware and Texas); 20 cases of amebic dysentery, 482 cases of bacillary dysentery (408 in Texas), and 394 cases of unspecified dysentery (348 in Virginia); 24 cases of Rocky Mountain spotted fever, of which only 5 occurred in the Mountain States; 25 cases of tularemia (9 in Arkansas); and 65 cases of endemic typhus fever (20 in Georgia, 18 in Texas, and 10 in Alabama).

The death rate for the current week in 88 large cities in the United States is 10.6 per 1,000 population, as compared with 10.7 last week and a 3-year (1939–41) average for the week of 11.0. The accumulated rate to date is 12.0 as compared with 12.3 last year.

The death rate for the United States in 1941 was 10.5 per 1,000 population, the lowest in the history of the death registration area. In 1938 and 1939 it reached the previous low of 10.6, while in 1940 it increased slightly to 10.8.

Telegraphic morbidity reports from State health officers for the week ended July 11, 1942, and comparison with corresponding week of 1941 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41
	July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941	
NEW ENG.												
Maine	1	0	0	------	------	------	38	103	21	4	0	0
New Hampshire	0	0	0	------	------	------	15	15	15	0	0	0
Vermont	0	0	0	------	------	------	74	47	30	0	0	0
Massachusetts	8	4	4	------	------	------	365	493	361	5	2	2
Rhode Island	0	1	0	------	------	------	50	9	20	0	0	0
Connecticut	1	1	1	------	------	1	145	220	43	2	0	0
MID. ATL.												
New York	7	14	15	[1] 1	[1] 3	[1] 1	605	915	738	10	8	4
New Jersey	1	6	8	1	1	2	285	500	500	3	3	0
Pennsylvania	0	4	9	------	------	------	196	1,086	630	4	3	3
E. NO. CEN.												
Ohio	3	2	8	4	1	2	62	435	246	0	1	1
Indiana	2	1	4	10	5	4	22	31	31	0	0	0
Illinois	13	12	25	4	2	3	73	228	228	1	1	1
Michigan [2]	2	4	4	------	1	------	118	518	370	2	1	1
Wisconsin	0	1	1	13	6	9	509	606	606	1	1	0
W. NO. CEN.												
Minnesota	4	1	1	1	------	------	80	7	18	0	0	0
Iowa	1	4	2	1	2	------	68	71	71	0	0	0
Missouri	5	1	3	------	------	------	38	58	16	2	1	0
North Dakota	3	3	0	1	------	------	7	8	8	0	0	0
South Dakota	2	0	0	1	------	------	10	7	0	0	1	0
Nebraska	1	0	1	2	------	------	37	9	9	0	0	1
Kansas	0	1	3	------	------	------	41	55	31	1	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	1	6	2	2	0	0
Maryland [2]	3	1	1	1	1	1	31	247	17	5	1	0
Dist. of Col	2	0	2	------	------	------	11	37	34	0	0	0
Virginia	3	2	6	20	26	19	29	279	128	1	0	1
West Virginia	1	1	2	2	4	4	2	171	34	0	0	0
North Carolina	3	3	3	------	------	------	43	285	127	1	1	1
South Carolina	9	8	4	122	105	105	52	182	18	0	0	0
Georgia	1	2	7	5	6	4	15	93	10	1	0	0
Florida	1	1	3	------	23	2	13	16	13	1	0	1
E. SO. CEN.												
Kentucky	3	1	2	------	------	3	11	77	45	0	0	1
Tennessee	4	1	3	16	21	12	9	71	46	3	3	3
Alabama	5	5	6	8	5	5	13	62	42	1	2	2
Mississippi [2]	8	3	4	------	------	------	------	------	------	1	1	1
W. SO. CEN.												
Arkansas	5	2	3	1	1	3	21	50	16	1	1	1
Louisiana	4	1	6	1	1	10	24	1	4	1	0	0
Oklahoma	3	3	3	3	5	5	27	41	17	0	1	1
Texas	[3] 28	7	13	122	253	60	68	80	99	4	1	1
MOUNTAIN												
Montana	2	3	0	------	------	------	44	21	21	1	0	0
Idaho	0	1	1	------	------	------	56	3	3	0	1	0
Wyoming	0	0	0	36	------	------	21	5	5	1	0	0
Colorado	5	4	5	21	6	------	43	32	32	0	0	0
New Mexico	0	1	1	------	------	------	4	13	10	0	0	0
Arizona	2	0	0	19	27	24	18	37	17	0	0	0
Utah [2]	0	0	0	------	------	------	168	8	46	0	0	0
Nevada	0	0	------	------	------	------	10	26	------	0	0	------
PACIFIC												
Washington	1	0	1	------	3	------	283	7	48	0	0	0
Oregon	1	4	1	1	7	6	52	17	17	0	0	0
California	16	12	22	21	33	10	856	179	179	2	0	2
Total	164	126	197	438	548	326	4,763	7,467	4,840	61	35	32
27 weeks	[3] 6,478	6,525	10,424	78,564	485,941	157,683	455,427	809,400	338,261	2,080	1,245	1,245

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 11, 1942, and comparison with corresponding week of 1941 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1937-41	Week ended		Median 1937-41	Week ended		Median 1937-41	Week ended		Median 1937-41
	July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941		July 11, 1942	July 12, 1941	
NEW ENG.												
Maine	0	0	0	7	0	3	0	0	0	0	0	2
New Hampshire	0	0	0	5	1	1	0	0	0	0	0	0
Vermont	0	0	0	0	3	2	0	0	0	0	0	0
Massachusetts	2	0	0	69	62	66	0	0	0	6	3	2
Rhode Island	0	0	0	1	0	6	0	0	0	1	1	0
Connecticut	0	0	1	14	8	23	0	0	0	1	0	2
MID. ATL.												
New York	2	2	2	110	113	141	0	0	0	8	8	5
New Jersey	0	0	0	34	37	43	0	0	0	3	2	3
Pennsylvania	1	7	0	74	50	122	0	0	0	6	8	8
E. NO. CEN.												
Ohio	0	3	1	61	47	52	0	0	1	5	6	7
Indiana	3	1	1	10	22	22	1	0	3	3	7	7
Illinois	2	9	2	57	97	133	3	4	4	2	12	9
Michigan [2]	0	3	3	41	74	102	0	4	0	4	5	3
Wisconsin	0	0	1	47	37	53	0	0	1	1	1	0
W. NO. CEN.												
Minnesota	0	6	0	21	20	24	0	0	2	5	0	0
Iowa	2	2	2	10	17	17	0	2	16	0	0	1
Missouri	1	1	1	12	18	18	2	0	4	6	9	9
North Dakota	0	0	0	9	1	3	0	0	5	0	1	1
South Dakota	0	2	0	7	3	5	0	4	6	0	1	0
Nebraska	0	0	0	7	9	5	1	0	1	0	0	0
Kansas	0	0	0	16	19	25	1	0	0	1	1	1
SO. ATL.												
Delaware	1	0	0	3	4	2	0	0	0	1	1	0
Maryland [2]	0	1	0	18	14	12	0	0	0	2	5	5
Dist. of Col.	0	0	0	11	3	3	0	0	0	0	0	0
Virginia	0	5	1	10	8	10	0	0	0	4	8	16
West Virginia	1	0	0	12	15	14	0	0	0	6	4	5
North Carolina	1	0	2	6	1	15	0	0	0	4	7	11
South Carolina	0	13	3	3	6	3	0	0	0	6	10	21
Georgia	4	40	6	8	7	7	0	0	0	17	19	25
Florida	2	11	0	2	0	1	0	0	0	8	5	2
E. SO. CEN.												
Kentucky	2	10	3	20	24	14	0	0	0	11	10	23
Tennessee	5	5	2	14	17	13	0	0	0	14	11	24
Alabama	4	40	5	5	8	9	0	0	1	8	7	7
Mississippi [2]	1	2	2	1	10	7	0	0	0	6	7	12
W. SO. CEN.												
Arkansas	12	0	0	3	0	2	0	0	0	8	14	17
Louisiana	1	1	1	5	1	4	0	0	0	24	12	21
Oklahoma	2	1	2	2	11	8	0	0	2	2	17	16
Texas	2	1	4	9	10	17	1	0	2	37	27	43
MOUNTAIN												
Montana	0	0	0	3	14	6	0	0	5	0	0	1
Idaho	1	0	0	4	10	1	0	1	2	1	1	0
Wyoming	1	0	0	3	1	2	0	0	0	0	0	0
Colorado	0	0	0	6	5	11	0	0	0	0	1	2
New Mexico	1	0	0	2	0	3	0	0	0	0	0	2
Arizona	0	0	1	3	0	1	0	0	0	1	3	3
Utah [2]	0	0	0	5	4	6	0	0	0	1	0	0
Nevada	0	0	------	2	0	------	0	0	------	0	0	------
PACIFIC												
Washington	0	5	0	8	11	13	0	0	2	0	1	1
Oregon	2	1	1	2	4	5	0	1	1	1	0	0
California	3	8	8	44	58	58	0	0	2	0	4	4
Total	59	180	101	826	884	1,225	9	16	96	214	239	361
27 weeks	668	937	905	85,119	85,928	111,719	577	1,109	7,466	2,592	2,893	4,164

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 11, 1942—Continued

Division and State	Whooping cough, Week ended— July 11, 1942	Whooping cough, Week ended— July 12, 1941	Week ended July 11, 1942: Anthrax	Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
NEW ENG.											
Maine	26	27	0	0	0	0	0	0	0	0	0
New Hampshire	4	1	0	0	0	0	0	0	0	0	0
Vermont	55	1	0	0	0	0	0	0	0	0	0
Massachusetts	221	116	0	0	0	0	0	0	0	0	0
Rhode Island	24	12	0	0	0	0	0	0	0	0	0
Connecticut	61	21	0	0	1	0	0	0	0	0	0
MID. ATL.											
New York	371	301	0	1	22	0	1	0	1	0	0
New Jersey	231	135	0	6	0	0	0	0	1	0	0
Pennsylvania	216	293	0	0	1	0	0	0	1	0	0
E. NO. CEN.											
Ohio	184	267	0	0	0	1	0	0	1	0	0
Indiana	62	30	0	0	0	0	0	0	0	0	0
Illinois	382	145	0	0	8	0	0	0	3	0	0
Michigan [2]	167	268	0	0	0	0	1	0	0	0	0
Wisconsin	223	168	0	0	0	0	0	0	0	0	0
W. NO. CEN.											
Minnesota	41	76	0	1	0	0	1	0	0	1	0
Iowa	27	55	0	0	0	0	0	0	1	0	0
Missouri	13	64	0	0	0	0	0	0	1	0	0
North Dakota	2	20	0	0	0	0	1	0	0	1	0
South Dakota	0	3	0	0	0	0	0	0	2	0	0
Nebraska	13	11	0	0	0	0	0	0	0	0	0
Kansas	69	164	0	0	0	0	1	0	0	3	0
SO. ATL.											
Delaware	2	7	1	0	0	0	0	0	0	0	0
Maryland [2]	45	65	0	0	0	0	0	0	3	0	0
Dist. of Col.	22	1	0	0	0	0	0	0	0	0	0
Virginia	57	46	0	0	0	348	0	0	3	2	0
West Virginia	15	38	0	0	0	0	0	0	0	0	0
North Carolina	86	229	0	0	0	0	0	0	0	0	0
South Carolina	65	165	0	0	0	0	0	0	0	0	6
Georgia	14	10	0	1	6	0	0	0	0	1	20
Florida	18	13		0	0	0	0	0	0	0	5
E. SO. CEN.											
Kentucky	75	64	0	0	6	0	0	0	0	0	0
Tennessee	22	56	0	0	0	13	1	0	0	3	1
Alabama	51	26	0	0	0	0	0	0	0	0	10
Mississippi [2]	------	------	0	0	0	0	0	0	2	0	1
W. SO. CEN.											
Arkansas	20	13	0	5	15	0	0	0	0	9	0
Louisiana	9	27	0	0	2	0	0	0	0	0	4
Oklahoma	12	27	0	0	0	0	0	0	0	0	0
Texas	203	203	1	4	408	0	0	0	0	0	18
MOUNTAIN											
Montana	17	10	0	0	0	0	0	0	1	0	0
Idaho	5	27	0	0	0	0	0	0	1	0	0
Wyoming	17	10	0	0	0	0	0	0	2	0	0
Colorado	33	196	0	0	0	0	0	0	1	0	0
New Mexico	24	15	0	0	4	0	0	0	0	1	0
Arizona	6	14	0	0	0	32	0	0	0	0	0
Utah [2]	31	79	0	0	0	0	0	0	0	1	0
Nevada	2	24	0	0	0	0	0	0	0	0	0
PACIFIC											
Washington	25	117	0	0	0	0	0	0	0	0	0
Oregon	30	16	0	0	0	0	0	0	0	0	0
California	222	402	0	2	9	0	3	0	0	3	0
Total	3,522	4,078	2	20	482	394	9	0	24	25	65
27 weeks	102,036	123,938									

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] A later report shows 11 cases of diphtheria in Texas for the week ended July 4, instead of 1 case as previously reported.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 27, 1942

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Atlanta, Ga	0	0	5	0	0	0	1	0	2	0	1	1
Baltimore, Md	1	0	------	0	36	8	2	0	12	0	0	42
Barre, Vt	0	0	------	0	3	0	0	0	0	0	0	6
Billings, Mont	0	0	------	0	10	0	0	0	0	0	0	1
Birmingham, Ala	0	0	6	0	0	1	3	0	0	0	0	2
Boise, Idaho	0	0	------	0	2	0	0	0	0	0	0	0
Boston, Mass	1	0	------	0	143	3	9	0	33	0	2	28
Bridgeport, Conn	0	0	------	0	1	0	0	0	7	0	0	4
Brunswick, Ga	0	0	------	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	1	0	------	1	10	1	7	0	6	0	0	2
Camden, N. J	0	0	------	0	0	0	0	0	9	0	0	7
Charleston, S. C	0	0	1	2	0	0	0	0	0	0	0	0
Charleston, W. Va	0	0	------	0	0	0	0	0	0	0	0	0
Chicago, Ill	9	0	2	0	20	0	20	0	51	0	0	155
Cincinnati, Ohio	1	0	1	0	3	1	1	0	10	0	0	7
Cleveland, Ohio	2	0	1	0	2	0	2	0	20	0	0	35
Columbus, Ohio	0	0	------	0	8	0	3	0	8	0	0	13
Concord, N. H	0	0	------	0	3	0	1	0	0	0	0	0
Cumberland, Md	0	0	------	0	0	0	0	0	0	0	0	0
Dallas, Tex	3	0	------	0	2	0	0	0	0	0	1	13
Denver, Colo	2	0	3	1	52	0	1	0	1	0	1	10
Detroit, Mich	1	0	------	0	38	0	15	0	63	0	1	39
Duluth, Minn	0	0	------	0	0	0	0	0	0	0	0	6
Fall River, Mass	0	0	------	0	6	0	1	0	10	0	0	2
Fargo, N. Dak	0	1	------	0	1	0	0	0	0	0	0	1
Flint, Mich	0	0	------	0	2	0	3	0	2	0	0	1
Fort Wayne, Ind	0	0	------	0	0	0	1	0	0	0	0	3
Frederick, Md	0	0	------	0	0	0	1	0	0	0	0	0
Galveston, Tex	0	0	------	0	0	0	4	0	0	0	0	4
Grand Rapids, Mich	0	0	------	0	0	0	0	0	1	0	0	7
Great Falls, Mont	0	0	------	0	3	0	1	0	0	0	0	3
Hartford, Conn	0	0	------	0	36	0	0	0	3	0	0	14
Helena, Mont	0	0	------	0	4	0	2	0	0	0	0	0
Houston, Tex	5	0	------	0	3	0	4	0	0	0	1	2
Indianapolis, Ind	1	0	------	0	25	0	1	0	4	0	0	16
Kansas City, Mo	0	0	------	0	21	0	2	0	6	0	0	1
Kenosha, Wis	0	0	------	0	6	0	0	0	0	0	0	16
Little Rock, Ark	0	0	2	0	1	0	2	0	1	0	0	------
Los Angeles, Calif	2	0	6	0	296	4	9	0	9	0	1	24
Lynchburg, Va	0	0	------	0	0	0	0	0	0	0	0	7
Memphis, Tenn	0	0	1	0	12	0	4	0	1	0	0	39
Milwaukee, Wis	0	0	------	0	335	0	0	0	16	0	0	25
Minneapolis, Minn	1	0	------	1	27	1	5	1	6	0	0	3
Missoula, Mont	0	0	------	0	0	0	0	0	1	0	0	0
Mobile, Ala	0	0	------	0	0	0	2	0	0	0	0	0
Nashville, Tenn	0	0	------	0	6	0	1	0	1	0	0	1
Newark, N. J	0	0	2	0	82	0	0	0	6	0	0	39
New Haven, Conn	0	0	------	0	11	1	2	0	0	0	0	2
New Orleans, La	2	0	1	1	29	1	3	2	1	0	3	3
New York, N. Y	9	1	2	0	71	11	38	2	77	0	6	215
Omaha, Nebr	0	0	------	0	10	0	0	0	1	0	0	4
Philadelphia, Pa	1	0	1	0	25	5	7	0	49	0	0	54
Pittsburgh, Pa	0	0	1	0	6	0	4	0	5	0	0	16
Portland, Maine	0	0	------	0	27	0	0	0	2	0	0	0
Providence, R. I	1	0	------	0	100	0	2	0	0	0	0	12
Pueblo, Colo	0	0	------	0	0	0	0	1	2	0	0	1
Racine, Wis	0	0	------	0	33	0	0	0	3	0	0	16
Raleigh, N. C	0	0	------	0	2	0	0	0	0	0	0	1
Reading, Pa	0	0	------	0	1	0	1	0	2	0	0	4
Richmond, Va	0	0	2	2	5	0	3	0	2	0	0	4

See footnotes at end of table.

City reports for week ended June 27, 1942—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Roanoke, Va	0	0		0	0	0	0	0	0	0	1	0
Rochester, N. Y	0	0		0	4	0	2	0	2	0	1	15
Sacramento, Calif	0	0		0	6	0	4	2	1	0	0	8
Saint Louis, Mo	0	0		0	14	0	3	1	1	0	0	2
Saint Paul, Minn	0	0		0	30	0	1	0	2	0	0	18
Salt Lake City, Utah	0	0		0	263	0	4	0	2	0	0	12
San Antonio, Tex	0	0		0	3	0	6	0	1	0	0	6
San Francisco, Calif	0	0		0	222	2	3	0	9	0	0	6
Savannah, Ga	0	0	5	0	2	0	0	0	0	0	0	0
Seattle, Wash	2	0		0	275	0	6	0	0	0	0	23
Shreveport, La	0	0		1	0	0	5	0	0	0	1	0
South Bend, Ind	0	0		0	0	0	0	0	0	0	0	1
Spokane, Wash	0	0		0	89	0	0	0	1	0	0	3
Springfield, Ill	0	0		0	4	0	0	0	2	0	0	0
Springfield, Mass	0	0		0	24	0	4	0	13	0	0	3
Superior, Wis	0	0		0	9	0	0	0	2	0	0	0
Syracuse, N. Y	0	0		0	314	0	5	0	0	0	0	25
Tacoma, Wash	0	0		0	26	0	1	0	0	0	0	0
Tampa, Fla	0	0		0	1	0	2	0	0	0	0	0
Terre Haute, Ind	0	0		0	0	0	1	0	0	0	0	0
Topeka, Kans	0	0		0	7	0	1	0	1	0	0	4
Trenton, N. J	0	0		0	0	0	2	0	3	0	0	6
Washington, D. C	2	0		0	42	2	9	0	8	0	1	28
Wheeling, W. Va	0	0		0	2	0	1	0	0	0	0	3
Wichita, Kans	0	0		0	18	0	4	0	1	0	0	4
Wilmington, Del	0	0		0	1	0	1	0	2	0	2	1
Wilmington, N. C	0	0		0	0	0	1	0	0	0	0	16
Winston-Salem, N. C	0	0		0	2	0	0	0	0	0	1	0
Worcester, Mass	0	0		0	2	0	11	0	9	0	0	48

Dysentery, amebic.—Cases: Boston 1; Los Angeles, 1; Minneapolis, 1; New York, 1; St. Louis, 1.
Dysentery, bacillary.—Cases: Baltimore, 3; Detroit, 2; Little Rock, 1; Los Angeles, 6; New York, 2; Richmond, 1.
Leprosy.—Cases: Los Angeles, 1.
Rocky Mountain spotted fever.—Cases: Galveston, 2; Spokane, 1.
Tularemia.—Cases: New Orleans, 1.
Typhus fever.—Cases: Charleston, S. C., 1; Houston, 2; New York, 3; Savannah, 1.

Rates (annual basis) per 100,000 population, for the group of 89 cities in the preceding table (estimated population, 1942, 34,058,487)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
		Cases	Deaths						
Week ended June 27, 1942	7.20	6.43	1.38	440.77	37.51	75.48	0.00	3.67	174.99
Average for week, 1937–41	12.69	4.64	2.17	[1]444.54	43.48	119.61	1.08	5.11	190.63

[1] Median.

PLAGUE INFECTION IN CALIFORNIA

Plague infection has been reported proved in specimens collected in California as follows:

Kern County: May 5, in a pool of 343 fleas from 28 ground squirrels (*C. beecheyi*) collected 12 miles east of Wheeler Ridge, Castac Lake area.

Lassen County: June 2, in tissue from 1 ground squirrel (*C. beldingi*) found dead 3 miles south and 9 miles east of Amedee.

Monterey County: June 20, in organs from 1 ground squirrel (*C. beecheyi*) taken at Fort Ord Military Reservation, 12 miles southwest of Salinas.

San Louis Obispo County: In organs from ground squirrels (*C. beecheyi*) as follows: June 7, in organs from 10 squirrels taken 43 miles east of Arroyo Grande, and in organs from 13 squirrels taken 2½ miles north and 8 miles east of Santa Maria; June 10, in organs from 10 squirrels taken from the same location.

Santa Barbara County: June 7, in organs from 13 ground squirrels (*C. beecheyi*) taken 12 miles east and 2 miles north of Santa Maria.

Siskiyou County: June 5, in mass pool of tissue from 5 ground squirrels (*C. douglasii*) taken from the Siskiyou Fair Grounds, 1½ miles south of Yreka.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—During the week ended June 20, 1942, a plague infected rat was reported in the Kapulena area and another rat was reported in Honokaa, Paauhau area, both in Hamakua District, Island of Hawaii, T. H. During the week ended June 13, 1942, a plague infected rat was reported in Hamakua District, Island of Hawaii, T. H., no other location being given.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 13, 1942.—During the week ended June 13, 1942, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		2	1	5	10	2	1		3	24
Chickenpox		14	1	117	318	49	32	23	94	648
Diphtheria		14	1	18	1	4		4		42
Dysentery				8					1	9
German measles				10	53	6	8	4	20	101
Influenza		2			3		3		9	17
Measles	2			244	258	136	10	6	42	698
Mumps	6	28		73	421	88	116	36	427	1,195
Pneumonia		5			14	3			3	25
Poliomyelitis						4			1	5
Scarlet fever		10	13	49	147	40	25	48	43	375
Tuberculosis		3	6	125	59	56	2	2	29	282
Typhoid and paratyphoid fever			1	23	1				5	30
Undulant fever					2					2
Whooping cough			2	172	69	9	2	1	103	358
Other communicable diseases		13		3	231	26	4	1	3	281

CHILE

Cerebrospinal meningitis.—According to recent information, cerebrospinal meningitis is reported to be epidemic in Santiago and Valparaiso and vicinity, Chile.

SWITZERLAND

Notifiable diseases—February 1942.—During the month of February 1942, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	28	Mumps	157
Chickenpox	126	Paratyphoid fever	18
Diphtheria	94	Poliomyelitis	12
Dysentery	1	Scarlet fever	236
German measles	23	Tuberculosis	289
Influenza	222	Undulant fever	9
Measles	615	Whooping cough	65

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

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS, for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Smallpox

England and Wales—Swindon, South.—During the week ended July 4, 1942, 3 cases of smallpox were reported in Swindon, South, Central England.

Scotland—Glasgow.—During the week ended July 4, 1942, 23 cases of smallpox with 2 deaths were reported in Glasgow, Scotland.

Typhus Fever

Algeria.—During the period May 21–31, 1942, 2,235 cases (111 in Algiers, and 58 in Oran) of typhus fever were reported in Algiers.

Bulgaria.—During the week ended May 30, 1942, 10 cases of typhus fever were reported in Bulgaria.

Iraq.—During the week ended May 30, 1942, 8 cases of typhus fever were reported in Iraq.

Spain.—During the week ended June 6, 1942, 13 cases (5 in Barcelona) of typhus fever were reported in Spain.

Yellow Fever

Colombia—Santander Department—Velez.—On May 19, 1942, 1 death from yellow fever was reported in Velez, Santander Department, Colombia.

* * *

COURT DECISIONS ON PUBLIC HEALTH

Sexual sterilization—habitual criminals—Oklahoma statute held unconstitutional.—(United States Supreme Court; *Skinner* v. *State of Oklahoma ex rel. Williamson, Atty. Gen.;* decided June 1, 1942.[1]) The Oklahoma habitual criminal sterilization act defined an "habitual criminal" as a person who, having been convicted two or more times for crimes "amounting to felonies involving moral turpitude" in either an Oklahoma court or a court of any other State, was thereafter convicted of such a felony in Oklahoma and sentenced to a term of imprisonment in an Oklahoma penal institution. Provision was made (a) for the institution by the attorney general of a proceeding in the Oklahoma courts against such a person for a judgment

[1] See The United States Law Week, volume 10, number 47, June 2, 1942, page 4424; 62 S. Ct. 1110.

that such person should be rendered sexually sterile and (b) for notice, an opportunity to be heard, and the right to a jury trial. If the court or jury found that such person was an habitual criminal and that he could be sterilized without detriment to his general health, then the court had to render judgment to the effect that he be sterilized. The law also provided that "offenses arising out of the violation of the prohibitory laws, revenue acts, embezzlement, or political offenses" should not come or be considered within its terms.

The petitioner in the instant case was convicted in 1926 of stealing chickens and was sentenced to the Oklahoma reformatory. In 1929 he was convicted of robbery with firearms and sentenced to the reformatory, and again in 1934 he was convicted of robbery with firearms and sentenced to the penitentiary. He was confined there when the sterilization act was passed in 1935, and in 1936 the attorney general instituted proceedings against him. The court instructed the jury that the crimes of which the petitioner had been convicted were felonies involving moral turpitude and that the only question for the jury was whether the sterilization operation could be performed on petitioner without detriment to his general health. The jury found that it could and the lower court's judgment directing that the operation be performed was affirmed by the Oklahoma Supreme Court [2] against the petitioner's contention that the act was unconstitutional by reason of the 14th amendment of the Federal Constitution.

Several objections to the constitutionality of the act were pressed upon the United States Supreme Court but the court passed those points without intimating an opinion on them because it said that there was a feature of the act which clearly condemned it and that was its failure to meet the requirements of the equal protection clause of the 14th amendment. As illustrative of the inequalities in the act it was pointed out by the court that in Oklahoma grand larceny, which was committed when the property taken exceeded $20 in value, was a felony and that embezzlement was punishable "in the manner prescribed for feloniously stealing property of the value of that embezzled." Hence, one who embezzled property worth more than $20 was guilty of a felony. A clerk, said the court, who appropriates over $20 from his employer's till and a stranger who steals the same amount are thus both guilty of felonies. "If the latter repeats his act and is convicted three times, he may be sterilized. But the clerk is not subject to the pains and penalties of the act no matter how large his embezzlements nor how frequent his convictions." As another example the court said that a person who entered a chicken coop and stole chickens committed a felony and could be sterilized if he was thrice convicted. If, however, he was a bailee of the prop-

[2] For an account of the decision of the Oklahoma Supreme Court see Public Health Reports, November 7, 1941, page 2185.

erty and fraudulently appropriated it, he was an embezzler. "Hence no matter how habitual his proclivities for embezzlement are and no matter how often his conviction, he may not be sterilized. Thus the nature of the two crimes is intrinsically the same and they are punishable in the same manner." It was also pointed out that under Oklahoma law the question whether a particular act was larceny by fraud or was embezzlement turned not on the intrinsic quality of the act but on when the felonious intent arose.

The guaranty of equal protection of the laws, said the court, is a pledge of the protection of equal laws. "When the law lays an unequal hand on those who have committed intrinsically the same quality of offense and sterilizes one and not the other, it has made as an invidious a discrimination as if it had selected a particular race or nationality for oppressive treatment. [Cases cited.] Sterilization of those who have thrice committed grand larceny with immunity for those who are embezzlers is a clear, pointed, unmistakable discrimination."

Milk—sale—use of paper containers.—(United States Supreme Court; *City of Chicago et al.* v. *Fieldcrest Dairies, Inc.*, 62 S. Ct. 986; decided April 27, 1942.) The city of Chicago, by a 1935 ordinance, required that milk or milk products "sold in quantities of less than 1 gallon shall be delivered in standard milk bottles." The respondent corporation sought a permit from the Chicago Board of Health to sell milk in "Pure-Pak" paper containers in that city but the permit was not granted. Thereafter the respondent filed suit in the United States district court alleging, among other things, that its "single service, sterile, sanitary and nonabsorbent" containers were "standard milk bottles" within the meaning of the Chicago ordinance and that the ordinance, if it were construed as prohibiting respondent from using its paper containers, was unconstitutional and invalid under the Federal and State constitutions. The complaint prayed for a declaratory judgment that the ordinance be construed so as not to prohibit respondent from using its containers or, in the alternative, that the ordinance, insofar as it prevented such use, was unconstitutional and invalid.

While the case was pending in the district court the so-called milk pasteurization plant law was enacted by the Illinois legislature. This statute contained certain provisions regulating the use of single service and paper containers and reserved to municipalities the power to regulate the distribution, etc., "of pasteurized milk and pasteurized milk products, provided that such regulation not permit any person to violate any of the provisions" of the act.

Later the district court held that respondent's containers were "standard milk bottles" within the meaning of the ordinance and that under the statute mentioned the city was without power to prohibit the use of such containers. On appeal the United States circuit court of appeals held[1] that the lower court erred in holding that respondent's containers were "standard milk bottles" within the meaning of the ordinance but concluded that the ordinance, insofar as it prohibited rather than regulated the use of paper containers, was invalid by reason of the State act.

The case was carried to the United States Supreme Court by the city of Chicago and others and that court stated in its opinion that it had granted the petition for certiorari because of the doubtful propriety of the district court and the circuit court of appeals undertaking to decide such an important question of Illinois law instead of remitting the parties to the State courts for litigation of the State questions involved in the case. The court's view was that the sound discretion which guides the determination of courts of equity called in this case for a remission of the parties to the State courts which alone could give a definitive answer to the major questions posed. "Illinois has the final say as to the meaning of the ordinance in question. It also has the final word on the alleged conflict between the ordinance and the State act. The determination which the district court, the circuit court of appeals, or we might make could not be anything more than a forecast—a prediction as to the ultimate decision of the Supreme Court of Illinois."

The judgment was vacated and the cause remanded to the district court with directions to retain the bill pending a determination of proceedings in the State court in conformity with the opinion.

---

[1] For an account of the decision of the United States circuit court of appeals see Public Health Reports, February 20, 1942, page 283.