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CURRENT WORLD PREVALENCE OF COMMUNICABLE DISEASES [1]

United States, March 11–April 7, 1928

The mortality in large cities increased during March, the average death rate in 68 large cities (annual basis) rising from 14.3 per 1,000 in the week ended March 10 to 15.3 in the week ended March 31, and to 15 in the week ended April 7. The seasonal increase continued unusually late, as the maximum mortality normally is expected by the middle of March, and the average death rate in the cities for the two weeks ended April 7 was higher than that for the corresponding weeks in any of the preceding seven years except 1926, when influenza was epidemic. Nevertheless, as a result of the unusually favorable mortality in January and February, the average death rate in the 68 cities in the first 14 weeks of the current year (14.2) is as low as that in 1924 and lower than that in any recent years except 1927 and 1921.

Influenza and pneumonia.—Reported cases of influenza increased continuously up to the first week in April, when 31 states reported 3,386 cases, as compared with 2,163 cases in the week ended March 3. Some increase occurred in most of the States reporting, which are distributed throughout all sections of the United States. The mortality from influenza and pneumonia combined increased during the first half of March and in the week ended March 17, the latest available, the mortality was higher than in the corresponding week of 1927 in the cities reporting in each of the geographical districts except in the South Atlantic and Pacific States.

The excess mortality over the corresponding week of a year ago was especially marked in the East and West South Central States and in the Mountain States.

Meningococcus meningitis.—More cases of meningococcus meningitis have been reported during 1928 than in the corresponding weeks of either of the preceding two years. The number of cases increased quite sharply during March, as is shown in the accompanying table, and the cases reported in the four weeks ended April 7 indicate a prevalence more than twice that of a year ago.

[1] From the Office of Statistical Investigations, United States Public Health Service.

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WISCONSIN 1920-1927

The October-December, 1927, State Board of Health Bulletin of Wisconsin, publishes the following statistics for Wisconsin for 1927 and comparison with previous years:

Mortality in Wisconsin in 1920–1927

Death classification, by cause or age	1927	1926	1925	1924	1923	1922	1921	1920
	Rate per 1,000							
All causes	10.3	10.6	10.5	10.2	10.7	10.0	10.1	11.1
	Rate per 100,000							
Typhoid fever	1.4	1.4	2.0	1.0	2.2	3.0	2.9	2.6
Smallpox	.2	.03	4.5	.4	.07	.07	.6	.3
Measles	3.3	5.0	2.2	2.6	7.1	1.6	1.5	8.3
Scarlet fever	2.1	2.6	3.7	7.3	8.7	6.3	8.9	9.5
Whooping cough	2.5	5.5	4.0	4.6	5.9	3.7	6.1	11.1
Diphtheria	4.4	5.4	6.1	7.3	13.0	9.1	14.8	14.3
Influenza	20.4	35.6	31.8	15.1	39.0	22.5	7.6	79.6
Erysipelas	3.1	2.8	2.3	2.9	3.1	2.5	3.6	3.3
Tuberculosis, all forms	59.3	64.8	61.0	62.9	65.8	69.6	74.9	84.7
Cancer	101.0	106.4	103.4	98.9	91.6	92.3	96.7	87.8
Meningitis	4.0	4.0	3.8	4.0	4.5	4.6	4.6	5.7
Pneumonia, all forms	64.8	82.5	88.7	89.4	106.3	90.5	107.8	109.6
Diarrhea (under 2 years)	13.8	15.1	20.1	14.6	18.6	18.5	28.3	24.4
Puerperal septicemia	2.3	3.5	2.5	4.5	4.5	3.7	4.5	4.6
Suicide	12.7	13.6	13.2	13.1	11.3	11.2	13.2	10.0
Accidental deaths	62.7	60.0	59.8	55.9	54.5	51.5	50.8	47.9
Automobile accidents	20.3	14.9	13.0	11.9	9.1	8.7	7.6	5.3
Homicide	2.2	2.3	2.1	1.6	2.2	1.8	2.1	1.5
	Number of deaths							
Under 1 year	3,356	3,799	3,728	3,689	4,059	4,043	4,381	4,267
1-4 years	762	922	956	857	1,142	927	1,103	1,377
5-64 years	12,858	12,997	12,919	12,498	12,781	11,839	12,048	13,956
65 years and over	12,264	12,106	11,284	10,741	10,962	10,280	9,762	9,837

THE PRACTICAL APPLICATION OF TWO QUALITATIVE TESTS FOR HCN IN SHIP FUMIGATION

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This investigation was undertaken with the idea of establishing a simple chemical test for the detection of HCN in practical ship fumigation, first, as an aid in determining when a vessel is safe for habitation of its crew and workers after the fumigation procedure is completed, and, second, to establish the earliest moment when it would be safe for members of a fumigating crew to enter a hold or compartment of a vessel for the purpose of further ventilation and to search for rats.

As a criterion for these tests the following basic principles were laid down to which a chemical test should conform in order to be of practical value:

1. The test should be definite under all conditions, at or above the predetermined danger point to human life.

2. It should be such as can be applied without attendant danger to those making it.

3. The time factor of its reaction should be slow enough to permit of accurate computation with an ordinary watch in the hands of the usual personnel engaged in this work.

4. The test should be efficient within at least a 10 per cent of error as to time.

5. The varying atmospheric conditions at seaports should not materially affect the application of the test.

Both tests herein described depend upon change in color of filter paper which has been previously immersed in certain solutions.

BENZIDINE COPPER ACETATE

This test is certain proof of the presence of hydrocyanic acid gas in the air in all cases where no disturbing constituents can come into question (oxidizing gases such as chlorine and nitric acid) and is completed by dipping a strip of filter paper in a solution of benzidine and copper acetate and exposing the moist paper to the air of the compartment to be tested. In the presence of HCN the filter paper turns blue in periods varying from three to thirty seconds, depending upon the concentration of HCN. The test was originated by Sieverts and Hemsdorf and consists of two solutions, as follows:

(1) 2.86 gms. copper acetate per liter of water.

(2) 475 c. c. saturated benzidine acetate solution with 525 c. c. of water.

Mix equal parts of (1) and (2) just before using. Slips of filter paper are dipped into this reagent and taken into the compartment to be tested in closed tubes. Upon exposure the paper will show from a very faint to an intense blue, indicating from 20 mgs. to 80 mgs. HCN per cubic meter.

A large number of tests were made with reagents, using many variations of the original formula. The most satisfactory was found to be that in which the original solutions were both diluted with equal parts of water. This gave a pale blue color on 10 seconds' exposure to 2.8 grams HCN per 1,000 cubic feet of air space. This modification of the original test was used in testing the holds and compartments of vessels during routine fumigation, and when used by those familiar with the test through laboratory experience it was found to be about 75 per cent efficient as compared with the results obtained in the usual method, that is, through the sense of smell, taste, and the exposure of white rats.

The benzidine copper acetate test requires that the test papers be read for a change in color after an exposure of from 7 to 10 seconds, which necessitates entering the compartment or hold before making the test (a procedure not without danger). An error of three seconds in reading the time factor would mean an error of 30 per cent or greater in the efficiency of the test. The results must be read while the color is rapidly changing and the operator is in the presence of HCN. The color changes, in widely varying concentrations of HCN, are so slight that it requires considerable laboratory experience with known concentrations of HCN in order to make accurate determinations.

METHYL ORANGE-MERCURIC CHLORIDE MIXTURE

This test depends for its perception on a change of color of No. 40 Whatman filter paper which has been immersed in a mixture of methyl orange and mercuric chloride solutions, to which has been added a specified amount of glycerine, and then drained and hung up to dry. This paper, which is an orange color, turns pink upon exposure to HCN gas.

Experiments with this reagent were begun by using a concentration of solutions as specified by chemists of the R. & H. Chemical Co., which is as follows:

Solution No. 1. Mercuric chloride gms. 5 dissolved in 250 c. c. distilled water.
Solution No. 2. Methyl orange gms. 2.5 dissolved in 250 c. c. distilled water.
These solutions are mixed in the proportion of two parts mercuric chloride and one part methyl orange, and to the mixture is added 0.5 c. c. glycerine for every 15 c. c. of the mixture. The sheets of filter paper are immersed in this solution and hung up to dry in air which is free from any trace of acid, and when dry they are cut in strips ¼ inch wide and preserved in glass tubes protected from the light.

In conducting these tests a fairly gas-tight room containing 1,267 cubic feet of air space was used, having two outside windows which permitted the admittance of outside air so that the relative humidity of the room was approximately that of the outside. No artificial heat was used. Before being used, the filter papers were exposed to the outside air for a period of two hours or more with an approximate relative humidity of 74 per cent. The HCN was introduced in the liquid form containing 20 per cent CNCl which, being previously measured, was distributed in shallow glass dishes at various points in the room, and 10 minutes were allowed to elapse for complete diffusion before beginning the tests.

In order to determine the exact length of exposure necessary to complete the reactions, the writer remained in the test compartment, wearing a gas mask, when the concentration was 2.8 grams per 1,000 cubic feet or over, and without a mask when a lesser quantity of HCN was used. Two glass tubes, each containing a strip of the paper to be tested, were taken into the test room, one being opened after the 10-minute diffusion period and the paper exposed to the HCN, the other vial being kept stoppered for comparison. This method enabled the operator to make notes as to the time of the color changes during the test.

As previous experiments with white rats had established the fact that 3.35 grams of HCN per 1,000 cubic feet of air space was the minimum lethal dose in a gas-tight compartment in an exposure of 12 hours, this concentration was taken as that in which a chemical test should give a definite reaction.

As the original test gave a reaction in 30 seconds, which was too fast for practical purposes in ship fumigation, a systemic series of tests was undertaken with lesser concentrations of the solutions, first diluting all reagents equally and then each reagent separately. Following this procedure a dilution of one-fourth the original concentration for methyl orange and mercuric chloride with double the original quantity of glycerine proved to give the most satisfactory results. This amended formula is given below, and the combined results of repeated tests are shown in the table.

Solution No. 1. Mercuric chloride, gms. 1.25; distilled water, c. c. 250.

Solution No. 2. Methyl orange, gms. 0.60; distilled water, c. c. 250.

Mix 10 c. c. of solution No. 1 with 5 c. c. of solution No. 2 and add 1 c. c. of glycerine.

Grams HCN per 1,000 cubic feet	Proportion of standard[1]	Duration of test in minutes				
		½	1	1½	2	3
6.7	1/10	Slight pink at edge	Faint pink	Definite pink	Red	Red.
3.35	1/20	No change	Slight pink at edge	Faint pink	Definite pink	Do.
1.675	1/40	do	No change	Brownish orange	Faint pink	Faint pink.
.8375	1/80	do	do	No change	Slight pink	Very faint pink.
.4187	1/160	do	do	do	No change	No change.
.2093	1/320	do	do	do	do	Do.

[1] The word "standard" indicates 2 ounces HCN per 1,000 cubic feet air space.

A study of this table shows that there is an approximate ratio between the concentration of HCN and the time of exposure. Two minutes' exposure to 1.67 grams of HCN per 1,000 cubic feet of air gives the same reaction as 1½ minutes' exposure to 3.35 grams, and a 1-minute exposure to 6.7 grams of HCN. It will also be seen that the minimum lethal concentration for white rats, namely, 3.35 grams per 1,000 cubic feet, is the lowest that produces a definite pink color within 2 minutes and that one-fourth that concentration (0.84 gram per 1,000 cubic feet) is the lowest concentration producing any change. In 2 minutes, 6.7 grams per 1,000 cubic feet, which is one-tenth the usual fumigation concentration, produces a distinct red.

From the test room in the laboratory the field of operations was transferred to vessels undergoing routine fumigation in New York Harbor, and a comparison was made with the live white rats which are used in testing holds. By means of a paper clip and string (a fishing line and reel is excellent), strips of the test paper were lowered into the holds for a 2-minute exposure, and upon withdrawal of the paper, white rats were immediately lowered into the hold in an open cage and in the same locality in which the test paper had been exposed. A series of 55 comparative tests were made on 10 vessels. In 42 of the tests in which the test papers did not show a definite pink in 2 minutes, the white rats gave no symptoms of HCN poisoning in the 10-minute exposure period. In 10 of 13 tests in which the papers turned a definite pink in 2 minutes, the white rats showed the effect of HCN by agitation or prostration in from 1 to 5 minutes. In three tests in which the paper turned pink within the 2-minute exposure, the rats did not become agitated or exhibit signs of HCN poisoning in 10 minutes' exposure. These three tests were performed during a light mist, and excessive moisture probably accelerated the reaction of the test papers. Following all negative tests the holds were immediately entered by members of the fumigating crew in the usual manner and in no case was excessive concentration of gas encountered.

As most of the tests undertaken in these experiments were made from the practical standpoint, and considerable variation had been noted between various reagents, in filter papers, and in the moisture content of the papers, it was believed advisable to have the work checked by experienced chemists. Through the courtesy of Mr. L. M. White, of the Roessler & Hasslacher Chemical Co., two of the company's expert chemists, Mr. F. S. Pratt and Mr. Mark Walker, undertook, in the California laboratory of the company, to check the work and elaborate certain details. The result of this detailed check by experienced chemical research workers confirmed the writer's work as outlined, and in addition showed that 1 cubic centimeter of glycerin in the solution gave better constant results than the 0.5 cubic centimeter previously used. It also emphasized the importance of humidifying the test papers to a moisture content of between 7 and 8 per cent and maintaining them at this point until used. The effects of chloro-picrin, which in small amounts is an ingredient of zyklon–B, was tested by these same chemists and it was shown that a rather high concentration of 0.02 per cent of this gas, by weight in the air, did not affect the test paper upon exposure for six minutes to the gas.

SUMMARY

Two chemical tests for the detection of HCN were given practical trials in the fumigation of vessels and in the laboratory. One of these, the benzidine copper acetate test, is too rapid and too sensitive for practical purposes. The other, the methyl orange-mercuric chloride test has been modified to meet fumigating conditions.

The methyl orange-mercuric chloride test is very much slower than the benzidine copper acetate test and is sensitive to a concentration very much lower than the minimum lethal concentration of HCN.

It requires two minutes to complete its reaction, which allows for an error of a few seconds in reading the time factor without materially affecting the calculations. It is made with a comparatively dry filter paper which can be prepared in advance at a convenient place and which will keep under proper conditions of humidity for 30 days. The test can be accomplished by lowering a strip of the test paper into a hold by means of a clip and string, thus avoiding danger to the operator through exposure to HCN gas. The only apparatus necessary is a string and clip, a dark container with a supply of test papers, and two small glass vials, one carrying the immediate supply of test paper and one containing a single test paper for comparison. When desirable the test paper can be carried into a room or compartment in a small vial and then exposed for the desired length of time. In this test a 10 per cent error in noting the time of exposure would not materially affect the resultant conclusions.

Chloro-picrin reacting slowly with the test paper will not interfere with the practical operation of the test when fumigants containing this ingredient are used.

As the time exposure necessary to produce a reaction is shortened as the humidity increases, and vice versa, too much credence should not be placed in this test if used during rain or fog; otherwise a definite pink color at the end of two minutes' exposure indicates a dangerous concentration of HCN gas in the air.

It is apparent that this test depends upon a judgment of color for its accuracy, and considerable laboratory care is essential in preparing and maintaining the test papers at a fairly constant moisture content. For these reasons it is not believed that the test can completely replace the tests of smell, taste, and lachrymation as now used. (Under laboratory conditions, working with known quantities of HCN, it was established that the sense of smell could detect 0.25 cubic centimeter of liquid HCN per 1,000 cubic feet of air space, or approximately $\frac{1}{280}$ of the standard concentration used in ship fumigation.) However, this test is of value and can replace the use of white rats for testing holds, and, in conjunction with the sense of smell, taste, and lachrymation, is valuable as a further aid of safety in the final clearing of a vessel. Owing to the fairly high atmospheric humidity at most seaports an error in this test will probably be on the side of safety, which would result only in a slight delay in the clearing of vessels.

Practical work at the New York Quarantine Station has shown that test papers under atmospheric conditions of between 70 and 75 per cent relative humidity, and preserved in tightly stoppered bottles with air of the same humidity, will give good practical results for a period of two weeks. Under these conditions a majority of the quarantine stations should be able to prepare their own test paper by using the wet and dry bulb method of ascertaining humidity or consulting the local United States Weather Bureau for data.

This test is of value and has been used at the New York Quarantine Station for the detection of leaking gas containers in storerooms and to establish the source of leakage from compartments undergoing fumigations.

DEATH RATES IN A GROUP OF INSURED PERSONS

Rates for Principal Causes of Death, February, 1928

The accompanying table is taken from the Statistical Bulletin for March, 1928, issued by the Metropolitan Life Insurance Co., and presents the mortality experience of the industrial insurance department of the company, by principal causes of death, for February, 1928, as compared with January and with February, 1927. The rates are based on a strength of approximately 18,000,000 insured persons in the United States and Canada.

A new low death rate for the month of February was established this year for this group of persons, the rate this year being 9.4 per 1,000 as compared with 9.6, which was recorded in both 1927 and 1921.

The Bulletin states:

The most important single factor in reducing last month's death rate to this new minimum was a drop in the mortality from tuberculosis to 89.5 per 100,000, as compared with 99.7 during the same month of 1927. Early indications point to a considerable reduction, for the year as a whole, from the previous minimal figure for tuberculosis which was established only last year. The year-to-date tuberculosis death rate among these policyholders for the first 12 weeks of 1928 was only 90.5 per 100,000, as compared with 97.7 for the same weeks of 1927. It should be borne in mind that the season of highest mortality from tuberculosis extends from January to May. If, therefore, the reduced death rate continues during March, April, and May, the end of 1928 will be almost sure to be signalized by still another new low record in the mortality from tuberculous disease.

Other diseases and causes of death to show improved mortality records over February of last year are typhoid fever, measles, scarlet fever, whooping cough, influenza, Bright's disease, conditions incidental to pregnancy and childbirth, suicide, and homicide.

On the other hand, the death rate in February was higher than last year for diphtheria, organic heart disease, and automobile fatalities. The rise in the diphtheria rate follows an increase in January over last year's figure for that month, and points strongly to a further rise in the diphtheria death rate this year. January and February are two of the months in which the diphtheria death rate runs much above the average.

The course of the automobile-accident death rate has been steadily upward for two decades, but no previous year has begun as badly as has 1928. Following a January death rate that had never been even approached by any previous figure for that month, no less than 228 policyholders were killed by automobiles in February, with a death rate of 15.8 per 100,000, which is higher by 37.4 per cent than the previous February maximum of 11.5 per 100,000, as recorded only last year.