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SELENIUM AS A POTENTIAL INDUSTRIAL HAZARD[1]

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The discovery and widespread study of selenium as a causative and contributing factor in certain animal diseases have aroused the interest of investigators in the significance of the element as a potential industrial hazard. The work of many investigators has been reported within the past 5 years, dealing with various phases of the selenium problem insofar as it is associated with agricultural activities. A summary of the results of these various investigations is given by Byers (*7*) and Stenn (*15*). Hamilton (*8, 9*) reports that the examination of workers in a copper plant, employed in extracting and purifying selenium, revealed symptoms indicative of selenium poisoning. The author has shown (*4*) that men employed in similar work excrete selenium in the urine and exhibit symptoms similar to those noted by Hamilton.

From the results of investigations of the acute and chronic effects of ingestion of selenium compounds by animals (*3, 7*) and the pathological changes brought about by inhalation of hydrogen selenide (*6*), it is logical to conclude that when selenium in soluble or unstable combination gains entry to the organism in sufficient quantity, either by inhalation or ingestion, injurious effects will be produced. Prolonged absorption of sublethal amounts of such compounds will produce changes which are due primarily to the selenium absorbed.

The primary purpose of this article is to point out those industries which may have unrecognized hazards due to the processing of selenium-bearing materials. The necessity of studying individual conditions in order to preclude the possibility of industrial poisoning is of the greatest importance. Details of the methods developed for determination of selenium in atmosphere as dust or vapors are given in this paper. Likewise, a satisfactory method of urine examination is outlined. These procedures have proved satisfactory under a variety of conditions.

The increasing uses and application of the element and its compounds necessitates a warning that selenium in certain combinations is toxic. Certain processes may be expected to prove injurious to those employed in plants utilizing selenium unless adequate protective measures are taken.

[1] From Laboratory of Industrial Hygiene, National Institute of Health.

INDUSTRIAL SIGNIFICANCE OF SELENIUM

The chief source of selenium used in commercial quantities has been that derived as a byproduct from the electrolytic refining of copper. A study of trade literature shows that the first uses of selenium were largely confined to the glass and ceramic industry, where it was used as a glass decolorizer and in the production of red glass and glazes. Later, the rubber manufacturers made such demands on domestic copper refineries that selenium was no longer a drug on the market; large stores from former years were necessary to meet increased demands. There has been an increasing demand for selenium during the past few years, to such a degree that domestic supplies are insufficient to meet domestic requirements (table 1).

TABLE 1.—*Production and consumption of selenium in the United States* [1]

Year	Sales of domestic produced selenium	Imports of selenium	Domestic consumption	Year	Sales of domestic produced selenium	Imports of selenium	Domestic consumption
	Pounds	*Pounds*	*Pounds*		*Pounds*	*Pounds*	*Pounds*
1921	55,978	1,106	57,084	1929	344,288	3,592	347,880
1923	127,174	940	128,114	1931	292,234	2,189	294,423
1925	194,007	5,807	199,814	1933	331,963	1,755	333,718
1927	284,508	15,286	299,794	1935 [2]	232,831	179,331	412,162

[1] U. S. Bureau of Mines Inf. Circular 6317. Minerals Yearbook 1934 and 1936.
[2] Latest available figures.

NOTE.—Prices of selenium average approximately $1.80 per pound.

In the past 8 years new processes utilizing selenium have been developed, as evidenced by the increased number of United States and foreign patents. These new applications, listed below, coupled with the steadily increased use by the ceramic industry, have exhausted present domestic supplies, necessitating the importation in 1935 of 179,000 pounds of selenium.

Uses of selenium

Glass decolorizer.
Production of ruby glass.
Red and yellow glazes.
Paint and ink pigments.
Production and coloring of plastics.
Alloying of machineable stainless steels.
Alloying of free machining copper base alloys.
Rubber "accelerators" and antioxidants.
Fireproofing of electric cable.
Photoelectric apparatus.
Chemicals.

In order to meet the increasing demands for selenium, it will be necessary to open new sources of supply. Because of the chemical similarity of sulfur, selenium, and tellurium, it is known that sulfide ore deposits will, in general, contain selenium and tellurium in small amounts. The processing of these sulfide deposits may result in furnishing varying quantities of these elements as byproducts. Development of methods of extraction of the selenium from various

minerals (table 2) and waste products may be expected to increase the supply of the element to keep pace with the increasing demands.

TABLE 2.—*Selenium content of certain minerals* [1]

Material	Selenium	Location
	Parts per million	
Cretaceous shale (Pierre)	103	Nebraska.
Do	23	Kansas.
Cretaceous shale	23	Colorado.
Do	57	Arizona.
Cretaceous shale (Niobrara)	55	Wyoming.
Do	22	Do.
Cretaceous chalk	30	South Dakota.
Cretaceous limestone	26	Nebraska.
Crude sulfur	8,350	Colorado.
Salt crust	260	Do.
Pyrites	55	South Carolina.
Do	75	Alabama.
Do	205	Nebraska.
Do	125	Virginia.
Do	250	Georgia.
Copper ore	7	Utah.
Copper concentrate	365	New Mexico.
Lead concentrate	385	Utah.
Zinc ore	430	Colorado.
Tellurium ore	430	Do.
Vanadium ore	125	Do.
	Percent	
Tiemanite ore	13.2	Utah.

[1] Taken from reference (*7*).

In an excellent résumé of his and others' work on the distribution of selenium in nature, Strock (*12*) states that the selenium content of the earth's crust approximates 0.005 percent. From detailed geological and mineralogical considerations, the conclusion is drawn that selenium may be expected in nearly all sulfur and sulfide ore deposits, with selenium-sulfur ratios from 1:10,000, an average value being 1:1,600.

Selenium has been reported in phosphate rocks from both foreign and domestic deposits. In general, certain western phosphates show greater amounts of selenium, ranging as high as 55 parts per million (*13*). It is also stated that selenium is volatilized completely when certain phosphates are calcined in the presence of water vapor.

While investigating the selenium content of a large number of soil samples, Byers made a most interesting observation as the result of certain determinations on soils taken from areas surrounding smelters. He stated, "A number of samples of soils and vegetation from areas subject to smelter fumes were examined. These include areas near Butte and Anaconda, Mont., Kennet, Calif., and Copper Hill, Tenn. In all cases selenium was found and in general a decrease in quantity as the distance from the smelter increased. This matter deserves fuller investigation." ((*7*), p. 74, Tech. Bull. 530.)

TOXICITY OF SELENIUM

The experimental work conducted by a large number of investigators on the effects on animals of ingested selenium compounds has

shown conclusively that soluble selenium compounds are toxic, producing both acute and chronic physiological effects. The toxic effects of such ingestion, above very low threshold limits, are in direct proportion to the amount of selenium compound consumed. The acute effects of ingestion of soluble selenium compounds may be summarized as consisting primarily of early cellular destruction in the liver, with later pathological changes throughout the organism. The ingestion of small quantities of selenium compounds over a long period results in retrograde changes in the liver and kidneys, accompanied by general debility.

The reported experimental work on the effect of inhalation of selenium or its compounds is confined to the work done on the effects of inhalation of hydrogen selenide (*6*). Acute and subacute effects resulting from single exposures of guinea pigs to hydrogen selenide are, primarily, an early severe fatty metamorphosis of the liver and late hypertrophy of the spleen.

The effects of industrial exposures have been reported by Hamilton (*8*, *9*) and the author (*4*). These investigators report the following symptoms occurring in certain of the men employed at copper refineries extracting or purifying selenium: Pallor, gastrointestinal disturbances, garlicky odor of breath and perspiration, irritation of nose and throat (rose cold), coating of tongue, metallic taste in mouth, and nervousness.

The symptoms given above are not pathognomonic for selenium and are characteristic of metallic poisoning in general. However, an analysis for selenium in urine from workers who are suspected of being poisoned by the element should be made (*1*, *2*, *4*). This confirmatory urine analysis is reported for those men observed by Dudley (*4*).

The excretion of selenium in the urine is conclusive evidence that workers are absorbing selenium. However, more clinical and experimental laboratory work is necessary in order to establish a method of differential diagnosis, based on the quantity of selenium excreted in the urine.

A satisfactory method of analysis for urine samples containing selenium is that previously reported (*2*, *4*). The urine, oxidized by 30 percent hydrogen peroxide and concentrated nitric acid, is taken to near dryness on a steam bath, at which time 10 cc of concentrated sulfuric acid are added in order to displace the nitrates and carbonize any remaining organic material. After further heating to drive off the remaining nitric acid, the residue is taken up in 48 percent hydrobromic acid containing free bromine. The selenium is distilled into a receiver along with the hydrobromic acid and excess bromine. From this acid solution the selenium may be precipitated by sulfur dioxide and hydroxylamine hydrochloride. The quantitative estima-

tion is carried out by filtering off the precipitate and redissolving in 48 percent hydrobromic acid containing 0.2 percent free bromine. This solution is then made to standard volume, 25 cc, and precipitated as before. Gum arabic is used to prevent settling of the precipitated selenium. The pink color produced is matched in standardized Nessler tubes with the color shown by standards of known content. Precipitation of standards and unknowns is carried out in an identical manner.

A slight modification of the reported technique is introduced so as to provide a more certain means of determining amounts of selenium as low as 0.01 mg. A first fraction of the distillate containing bromine and selenium is collected, amounting to about 75 cc. This fraction is in turn distilled so as to give a final volume of distillate of 20 cc. In this manner amounts of selenium of the order of 0.01 mg are easily seen after precipitation with sulfur dioxide and hydroxylamine hydrochloride, and standing for 2 or 3 days.

The probable presence of a volatile selenium compound in the urine made advisable the addition of the hydrogen peroxide prior to acidification with nitric acid. The effervescence produced on acidification when carbonates are present tends to carry off the volatile compounds. The acidified urine mixture is allowed to remain overnight in the cold to complete the oxidation before evaporation on a steam bath.

The samples may be obtained by allowing the subjects to urinate directly into 2½-liter glass-stoppered bottles. The danger of accidental contamination by dust and fumes at the plant makes collection there inadvisable. Thymol is used as the preservative.

Blanks on all reagents should be run from time to time in order to avoid contamination. Double quantities of all reagents used, when combined, should show no detectable quantities of selenium.

POSSIBLE SOURCES OF SELENIUM HAZARDS IN INDUSTRY

In table 3 are shown the industries that are manufacturing or processing selenium or selenium-bearing material. For convenience in discussion these industries have been divided into primary and secondary classes. The primary group includes those industries which extract, mine, treat, or process natural-occurring minerals which contain, in some cases, selenium in appreciable quantities. The secondary group includes those industries which utilize selenium and selenium compounds as basic materials in manufacturing processes.

The processes which on casual inspection may be expected to afford hazards to the worker are listed in table 3. The information presented is intended merely to designate potential hazards. Only by an environmental survey, with sampling of workroom atmosphere for selenium contamination, can there be any authentic evaluation of

the occupational hazards inherent in any of the industries or processes listed. Methods for sampling workroom atmospheres have been developed (*5*, *6*) and are described below in detail. By suitable modifications of the technique, one is able to determine very minute amounts of selenium in nearly any form or combination.

TABLE 3.—*Industries and their possible selenium hazards*

Industry	Source of hazard	Type of hazard
Primary industries:		
1. Copper	Ore concentrate and flue dusts, sludges.	Se, SeO_2 and mixed dusts.
2. Lead and zinc	do	Do.
3. Pyrites roasting	Roasting towers, sludges	Mixed dusts, Se.
4. Lime and cement (certain areas).	Dust, kiln gases	Mixed dusts, SeO_2.
Secondary industries:		
1. Glass, ceramics	Melting pots and furnaces	Fumes of Se, SeO_2.
2. Rubber	Vulcanizing and curing processes	Organic vapors, H_2Se.
3. Steel and brass	Alloy furnaces	Dusts, Se, SeO_2. Fumes.
4. Paint and ink pigments	Pigment compounding and mixing	H_2Se, SeO_2, soluble dusts.
5. Plastics	Mixers, presses	Organic vapors.
6. Photoelectric	Melting and casting operations	Vapors, Se, SeO_2.
7. Chemicals	Mixing, melts, synthesis	Se, SeO_2, H_2Se, organic vapors.

Gas and vapors.—Vapors and gaseous constituents of plant atmosphere, and contaminations in laboratory workrooms, as well as those experimentally produced for animal exposure tests, may be sampled quantitatively by means of the apparatus outlined in figure 1.

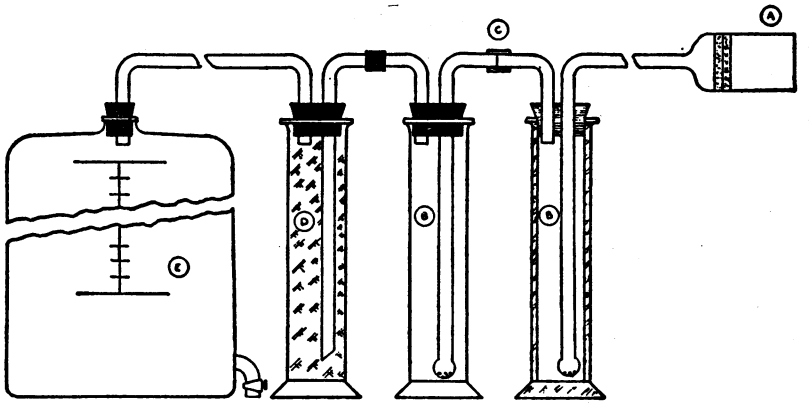

FIGURE 1.—Gas sampling apparatus. A, filter tube, 1½ by 3 inches sintered glass plate overlaid with asbestos; B, gas bubblers, 8 by 1½ inches, inside measurement, capacity 200 cc, rubber stoppered, contains 50 cc of 40 percent HBr, 10 percent bromine mixture; C, all connections glass to glass, rubber sleeved; D, vapor check tube, contains soda lime or charcoal, etc.; E, calibrated aspirating bottle, 10 or 20 liter capacity.

The sampling arrangement for absorbing gases or vapors consists first of a sintered glass plate, overlaid by a fine, dried, asbestos mat (A) which is designed to screen out all solid particles or droplets which might enter the bubblers. After passing this screen the air-gas mixture is bubbled successively through two bubblers (B), each contain-

ing a mixture of 40–48 percent hydrobromic acid, with free bromine 10 percent by weight. The oxidizing power of this solution is utilized to oxidize the selenium, whereby it can then be dissolved by the acid medium. After passing through the bubblers, the air stream moves into an absorption tube (D) containing some suitable material, in order to remove hydrogen bromide and bromine vapors. The suction or sampling bottle (E) contains water. As this water issues from the stopcock at the bottom of the bottle, air is drawn into the bottle through the bubbler chain. Since the volume of water displaced by the air is known, it is possible to determine the amount of selenium contained in this volume of air by analysis of the bubbler solutions.

The sampling bottle (E) consists of a 10- or 20-liter demijohn, calibrated to the required volume. A sample of 10 liters will prove sufficient in gas-air mixtures with selenium concentrations of more than 0.01 mg selenium per liter. For smaller amounts, 20 liters or more of the gas-air mixture must constitute the sample. The bubbler chain consists of two bubblers, each containing 50 cc of a mixture of 40 percent free bromine. The gas trap (D) may conveniently be another bubbler filled with loosely packed, coarse, granular soda lime, activated charcoal, or calcium hydroxide. This gas trap is necessary in order to absorb the vapors of bromine and hydrogen bromide carried over by the air stream. These vapors, if allowed to enter the sampling bottle, will give incorrect values since the volume of water drawn from the bottle is assumed to be a true measure of the volume of air sampled. Two bubblers have been found sufficient to entrap all the selenium in gas-air mixtures with concentrations ranging from 0.005 to 0.30 mg selenium per liter. In the development of the method, three bubblers were used at the higher concentrations. No selenium was found in the third bubbler but traces were often found in bubbler No. 2. The maximum rate of sampling used with uniform success was 2 liters per minute.

The sampling bottle should be of sufficient capacity so that water to the height of 5 to 8 inches remains in the bottle after 10 or 20 liters have been withdrawn. This layer of water is necessary in order to overcome the resistance in the bubbler train caused by the hydrostatic pressure of the hydrobromic acid in the bubblers. By controlling the rate of outflow of the water from the sampling bottle by means of the stopcock, it is possible to obtain a relatively constant sampling rate. With the decrease in the height of the water in the sampling bottle, the rate of sampling tends to decrease. Suitable manipulation will overcome this difficulty.

The asbestos pad, superimposed on the sintered glass filter, may be used in determining dust concentrations, as shown below. In gas-air determinations the asbestos pad may be used to filter out dust particles. As the amount of sample is rather small, no dust determina-

tions have been made using these asbestos pads when sampling air-gas mixtures. If dust samples are required, simplified methods are available by which much larger samples may be obtained (*4*).

The contents of the bubblers may be combined and the selenium precipitated directly with sulfur dioxide or solid sodium sulfite. After the bromine is completely discharged, 1 or 2 grams of solid hydroxylamine hydrochloride are added. The mixture is then heated on a steam bath for one-half hour, and allowed to settle overnight. The resulting precipitate may be filtered on asbestos, redissolved with 40 percent hydrobromic acid containing 0.5 percent free bromine and reprecipitated as before, using filtered, saturated aqueous solutions of the reagents. If sufficient selenium is present, the second precipitate may be weighed on a tared Gooch crucible, after drying 1 hour at 105° C.

If the total amount of selenium in the combined hydrobromic acid bubbler solutions is less than 1 mg, it is recommended that the free bromine of the combined bubbler solutions be partially removed by treatment with solid sodium sulfite. Sufficient bromine should remain to impart a deep yellow color to the solution. This mixture is then distilled (*1*), the selenium precipitated from the distillate, filtered, redissolved, and estimated colorimetrically (*1*, *2*, *3*).

If the total amount of selenium in the bubbler solutions ranges between 1 and 5 mg, it may be made up to standard volume of 100 cc on dissolving the first precipitate with hydrobromic acid and bromine. A suitable aliquot may be taken and made up to 25 cc, the colorimetric estimation being carried out with this fraction. In practice the colorimetric estimation has been found to be most accurate when the amount of selenium is between 0.05 and 0.50 mg selenium per 25 cc of solution. The concentration of hydrogen bromide must be kept between 25 and 30 percent, since at this acid concentration the precipitate appears with readiness and in a form most easily matched in color. Hydrobromic acid of 25 to 30 percent concentration has been found to be most advantageous for the precipitation of selenium in this and similar analyses, utilizing the precipitation of selenium from hydrobromic acid solutions. As a rough approximation, when precipitating selenium from 48 percent hydrobromic acid solutions, add aqueous solutions of reagents or distilled water to increase the volume one-third.

In practice the above method for the absorption of gaseous selenium products has been found applicable to a variety of gases, namely, hydrogen selenide, selenium dioxide, ethyl selenide, methyl selenide, as well as various mixtures of unknown volatile selenium compounds produced on putrefaction of organic materials.

A soda lime tube has been used with great success in sampling atmosphere for hydrogen selenide content. The tube is of simple

construction, being made from a 6-inch by ¾-inch pyrex test tube by sealing a glass tube in the closed end. At sampling rates of 4 liters per minute or less, these tubes, when charged with fresh, dry, soda lime, are satisfactory at all concentrations below 0.10 mg Se/liter. The selenium is recovered from the soda lime tube by distillation with hydrobromic acid (*1*). The selenium is precipitated and weighed or estimated colorimetrically.

Dusts.—For the study of dust concentrations in terms of numbers of particles per unit volume, methods are elsewhere presented (*11*) which have proved satisfactory. No discussion of these methods is necessary here since they apply to a variety of problems. The conditions of a particular study will determine the mode of sampling and the apparatus to be used. However, in studies of selenium dusts, if the total selenium content is to be found, only a limited number of methods present themselves.

The paper-thimble method of screening dusty atmosphere in order to obtain samples for chemical analysis (*11*) has proved satisfactory in a number of studies which involve many more technical difficulties than will be encountered in studies of selenium dust. The paper thimble and the cotton wool contained therein may be treated intact by the method of Williams and Byers for pyrites (*16*). Treatment in this manner will give excellent results and the total selenium content of the dusts will be determined, even though particles of the heavy metal selenides are present. Selenium of the order of 0.02 mg may be detected if reasonable care and proper technique are used (*1*, *2*).

In the study of certain dusts a method of air filtering, as shown in figure 1, will prove very satisfactory. This filter consists of a tube in which is sealed a sintered glass plate, approximately 1½ inches in diameter. This porous plate is overlaid by a smooth, fine, dried asbestos mat. The mat may be easily washed off and reformed from prepared Gooch asbestos suspensions. By having the mat oven-dried (105° C. for 1 hour), very little resistance will be built up in the suction lines. Such a mat has been found to screen out the more commonly encountered dust as well as fog particles.

The filter, prepared as above, may be acid washed, dried at 105° C., and weighed. The dusty air may then be drawn through the filter, which is again dried and weighed. The weight of dust particles per unit volume of air may be calculated if the volume of air passing the filter is known.

The chemical composition of the dust, insofar as total selenium is present, may be arrived at by washing the asbestos pad into a beaker and treating as for pyrites (*16*). If the dust consists of elemental selenium, selenites, or selenates, 48 percent hydrobromic acid containing 1 percent free bromine may be drawn through the filter and the selenium distilled from the acid solution (*1*).

Either paper thimbles or asbestos pads are suitable for screening large samples. Types of samplers and methods of measuring air flow in use by the United States Public Health Service may be adapted to this type of work.

The filter arrangement of figure 1 will prove helpful in screening small samples of air-gas-dust mixtures. However, the slow rate of sampling required by this procedure may be insufficient to give adequate dust samples except where heavy concentrations are encountered. By treating the asbestos pad as suggested above and distilling the selenium with hydrobromic acid, amounts of selenium from 0.02 mg to 1.00 mg may be estimated colorimetrically (*1*, *2*).

TOXICOLOGICAL ASPECTS OF INDUSTRIAL HAZARDS DUE TO SELENIUM

Little is known of the toxic properties of selenium and its compounds insofar as this knowledge applies to industrial problems. Those processes which on casual inspection appear to present hazards have already been discussed (table 3). As has been previously stated, the purpose of this paper is to point out the possibility of the existence of such hazards in certain industries in order that those charged with hygienic control will be in a position to recognize the hazards and the possibilities of their elimination.

The extent of the hazard existing in industries where selenium is present is due primarily to the types of processes being carried out. Dusts, fumes, vapors, or liquids may result in definite hazards, the scope and degree of which are dependent upon the processes in progress and the protective devices used to dissipate the noxious materials. The dusts may be of such composition that on inhalation no soluble selenium compound is liberated. Soluble dusts, such as SeO_2, SeO_3, H_2SeO_3, H_2SeO_4, and certain halogen compounds may prove toxic because of the ease by which they are absorbed both by the lung tissue and from the alimentary tract. Selenium vapors may consist of certain of those soluble dusts listed, because of their relatively high vapor pressures at ordinary temperatures. However, the most noxious vapors may be expected to include organic compounds, i. e., methyl selenide, ethyl selenide, aromatic selenides, etc., as well as hydrogen selenide.

Absorption of organic selenium compounds through skin contact has not been studied experimentally. However, it has been shown that burns resulting from hot acids containing selenium as the bromide resulted in the appearance of selenium in the urine of the person so affected within 2 days (*4*).

The toxic effects of selenium compounds may differ with the mode of entry into the body. Inhalation of vapors will provide entry to the organism at the alveolar surfaces, as will entry of soluble dusts and dusts which are rendered soluble by phagocytic action. Ingestion

of selenium-bearing material as a secondary result of inhalation may be occasioned by expulsion of such material from the respiratory tract. However, it must be stressed that cleanliness of habits and care at meal times are necessary to prevent ingestion of dirt from the hands. It is possible that absorption of organic liquids through the skin may provide an entry for the element, as on handling solvents or plasticizers, particularly at higher temperatures.

In determining the possibility of selenium poisoning, the occupational environment must be considered. If persons are exposed to selenium fumes or dusts, and show symptoms indicative of metallic poisoning, further confirmatory tests are evidently necessary in order to establish whether selenium is being absorbed. A thorough medical examination of the worker, accompanied by clinical laboratory studies, is suggested. An analysis of the 24- or 48-hour output of urine for selenium (*1*, *2*, *4*) is recommended as a confirmatory test. Normal human urine contains no detectable quantities of selenium. However, it must be pointed out that persons living in certain regions (*10*) show quantities of selenium in the urine due to consumption of locally grown foodstuffs which contain selenium. Local water supplies contaminated by selenium may account for its appearance in the urine of persons residing in certain areas (*14*).

The foregoing considerations have clearly shown that selenium presents potential hazards of such degree that further study is warranted. The adoption of control measures is suggested in order to protect workers from injurious effects as the result of absorption of seleniferous materials.

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ACUTE RESPONSE OF GUINEA PIGS TO INHALATION OF METHYL ISOBUTYL KETONE

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Methyl isobutyl ketone, commercially known as hexone, has been proposed as a diluent and denaturant of ethyl alcohol for external use, and is used industrially in making varnishes and lacquers, as are also methyl ethyl ketone (butanone) and methyl propyl ketone (pentanone). Of these ketones, the toxicity of the last two, with respect to inhalation, has been reported in the literature *(1)* in such a way as to give the limits of time and concentration of vapor which cause a series of symptoms and reactions graded in severity to the point where death is caused during the exposure. There has been, apparently, no such work on hexone. The toxicity of this compound as regards contact and ingestion will not be reported here.

PHYSICAL PROPERTIES

The first samples of commercial hexone used in these experiments contained about 5 percent of the alcohol used in its preparation, namely, secondary isobutyl carbinol, and some water. Subsequently a highly refined lot was obtained which tested as 99+ percent ketone and which was used in all the reported experiments. According to the chart prepared by the manufacturer, commercial hexone boils initially at 112° C. and finally at 118° C. The International Critical Tables give 119° C. as the boiling point of the pure product. Its molecular weight is 100.09, density 0.803, and refractive index 1.3949 at 20° C. It freezes at −84.7° C. The vapor tension of the commercial product, given by the manufacturer as 25 mm mercury at 30° C., is undoubtedly depressed by the presence of water vapor, since careful tests with pure hexone in the absence of water gave 40 mm Hg at 29.5° C. However, since under most circumstances there is water present, the lower value is the more practical one for calculating saturated vapor-air atmospheres.

ANALYSIS

The chemical analysis follows that used by Patty, Schrenk, and Yant.[1] Certain modifications were made, particularly in the method of adding the iodine solution to the sample. The results were calculated as milligrams per liter and converted to percent by volume on the basis that 1 gram molecular weight of hexone is equivalent to 24.45 liters of vapor at 25° C. and 760 mm pressure.

A Florence flask (1,000 ml) was used for the sampling and analysis. The flask, fitted with a one-hole rubber stopper and a glass stopcock, was calibrated with water. The dried flask was then charged with 50 ml NaOH (1 N) and connected to a vacuum pump and mercury gage. The sampling tube, which extends to the center of the exposure chamber, was flushed by withdrawing 1 liter of the air-vapor mixture.

The reading on the mercury gage was recorded, the stopcock closed, and the flask connected to the sampling tube. The volume of the air-vapor sample was calculated from the reading of the mercury gage and the observed barometric pressure, correction being made for the 50 ml occupied by the NaOH and the air contained in the upper section of the stopcock.

After collecting the sample, the flask was shaken to absorb the vapor in the NaOH solution. In order to avoid any loss of hexone vapor the flask was then cooled to reduce the pressure and an excess of 0.1 N iodine solution was drawn in through the stopcock which was rinsed several times with water. The contents of the flask were shaken vigorously and allowed to stand for 30 minutes at room temperature to allow the reaction to go to completion. The stopcock was opened to relieve the pressure, care being taken to avoid spattering. The stopcock, stopper, and flask were rinsed with water and 25 milliliters H_2SO_4 (2 N) were added to the contents. The concentrations of NaOH and H_2SO_4 were so adjusted that 50 ml NaOH was equivalent to 24.6 ml H_2SO_4. The excess iodine was titrated with 0.1 N sodium thiosulfate, using starch solution for the end point.

This method was standardized by analyses of a standard solution of hexone, a water solution containing 2 ml hexone per liter. When 25 ml of this solution (0.05 ml hexone) were used the average recovery in 12 determinations was 104.0 percent (103–105).

Cassar (*3*), in a report on methyl ethyl ketone, has shown that a recovery of 110.6 percent is obtained, due to a secondary reaction. The above recovery (104.0 percent) indicates that the commercial product which we used was 94 percent hexone, provided that a

[1] The analyses on commercial hexone were performed by W. H. Reinhart, B. S., M. S., who adapted the method given here in detail and which was used throughout the experiments. The analyses on pure hexone were performed by Peter J. Valaer, B. S.

similar secondary reaction takes place to the same extent with this compound.

The specific gravity of this sample was found to be 0.7974 at room temperature (25° C.). The Handbook of Chemistry and Physics (*2*) gives 0.8017, 20°/4° C., for methyl isobutyl ketone.

The excess of iodine varied considerably in the determinations. Cassar reported 15–35 percent excess as being satisfactory. The procedure was tested by varying excess of iodine, time, and temperature:

Excess of iodine		Recovery		
Expected (Cassar)	Actual	Range	Average	Expected (Cassar)
Percent	*Percent*	*Percent*	*Percent*	*Percent*
0.1	6–8	102.6–104.4	103.4	110.6
20	26–28	103.4–105.1	104.3	110.6
100	114	103.3–103.8	103.6	110.6

Time (for reaction—at room temperature)

1 minute=102.0 percent recovery.
10 minutes=104.2 percent recovery.
63 minutes=104.4 percent recovery.

Sample kept cold (about 10° C.) during reaction

15 minutes=103.7 percent recovery.
26 minutes=104.3 percent recovery.

APPARATUS

The exposures were made in a glass-walled box of 1 cubic meter capacity connected serially by a centrifugal blower to a 1,000 cubic-foot chamber (fig. 1). The small chamber was fitted with fan and elevated pierced platform assuring equilibration of the gases in the chamber. Since an unlimited supply of the solvent was not at hand, a flowing atmosphere type of exposure was not feasible and static atmospheres had to be used. A large door sealed with sponge rubber was provided with armholes through which extended rubber gauntlets made of a section of inner tube and terminating in surgeon's gloves. A satisfactory temporary seal between gauntlet and glove was made by stretching both over a metal ring. An air lock between the chamber and the outside provided a means of introducing the animals or of removing them from the chamber at any time. Thus, concentrations of a desired magnitude could be built up at leisure and the animals introduced directly into this atmosphere. For exposures of short duration at high concentrations a saving of the material being tested was effected by using the small chamber alone. Analyses made of the oxygen content at various times during the exposures indicated that no perceptible diminution had taken

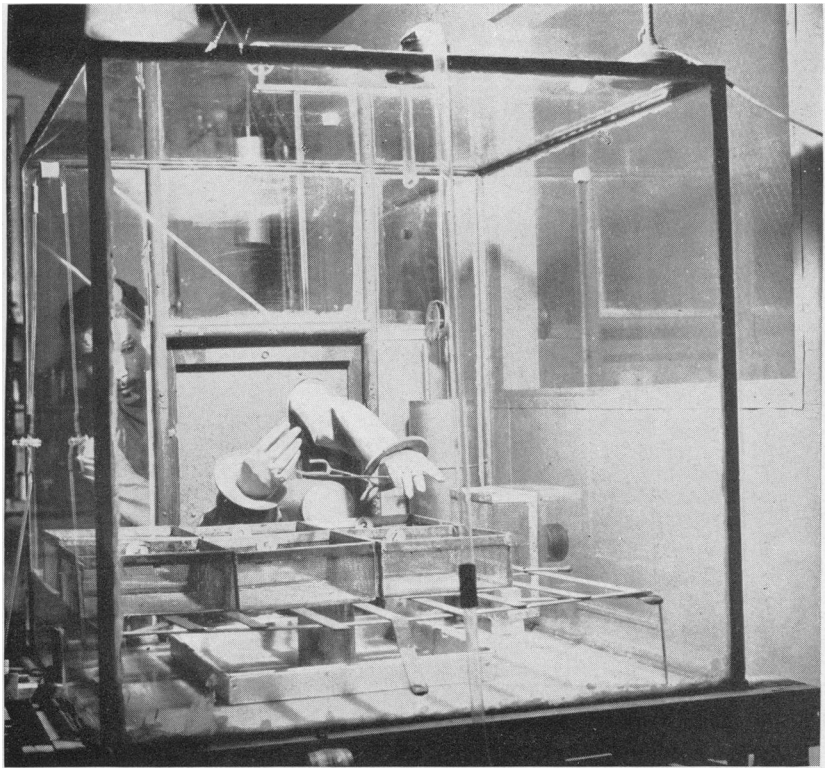

FIGURE 1.—One cubic meter exposure chamber showing door with gauntlets and air lock. To the right is a small circulating fan. In the foreground and at the top is the inlet from the large chamber, which can be seen in part at the right. The sampling tube can be seen extending diagonally from upper left to the center of the chamber.

place. It was assumed from this fact that carbon dioxide concentrations were not physiologically significant and support for this assumption was derived from respiratory data taken during a blank run with a maximum number of animals.

METHOD

Data were collected at each of five concentrations of hexone: 2.8 volume percent (saturation), 1.68 volume percent, 1.0 volume percent, 0.3 volume percent, and 0.1 volume percent, with particular regard to the following plan in which are arranged the responses or symptoms of guinea pigs in order of increasing severity of reaction:

1. Irritation of the cornea and conjunctiva (blinking of eyes, lacrimation, rubbing of eyes).
2. Irritation of buccal, nasal, and pharyngeal passages. (Sneezing, coughing, salivation, retching, rubbing of nose and mouth.)
3. Narcotization of central nervous system. (Postural instability, loss of auditory and corneal reflexes, change in respiratory rate and character, coma and death.)
4. Changes in metabolism of tissues (change in rectal temperature, change in pulse).

RESULTS

It is proposed to recapitulate here the protocol of an exposure at an average concentration of 1.68 volume percent hexone. A comparison with the effects at other concentrations follows in the discussion.

One hundred and twenty-five cubic centimeters of pure hexone were evaporated in the 1-cubic-meter chamber. The chamber temperature was 25.7° C., rising to 26.3° C. at the end of the exposure. Ten female guinea pigs of about 300 grams body weight were placed in the chamber through the air lock and a sample of the vapor air mixture withdrawn (1.81 volume percent). The normal rectal temperature taken immediately before exposure was 38.9° C. and the respiratory rate at rest was 117 beats per minute. A freshly killed pig was introduced to compare the rate of fall of temperature in the absence of normal metabolism.

Up to 1 minute.—Immediately upon introduction to the test atmosphere the pigs began to squint and rub their noses and eyes violently. Copious lacrimation occurred and sneezing and coughing was very frequent.

2 minutes.—Salivation was evident by the wet area about the mouth, neck, and brisket.

10 minutes.—All pigs were so weak that they could not remain erect; other symptoms in proportion.

15 minutes.—All pigs over on side making only feeble movements at most and usually quite inert. Corneal reflex still present. Pinnal flick in response to sharp click still present. (Auditory reflex.)

25 minutes.—Respiratory rate has dropped to 35 per minute, rectal temperature to 36.6° C.

40 minutes.—Pulse by palpation estimated at 240 beats per minute. Auditory and corneal reflexes gone. Respiration gasping and random pawing movements appear occasionally.

60 minutes.—Rectal temperature 34.7° C. Pulse 181 beats per minute. Concentration 1.70 volume percent.

85 minutes.—First death. Average temperature of survivors 33.4° C., pulse 143 beats per minute, respiratory rate 20 per minute.

94 minutes.—Second death.

108 minutes.—Third death.

125 minutes.—Fourth and fifth deaths. Average rectal temperature of survivors 32° C., pulse 155 beats per minute, respiratory rate 85 per minute.

131 minutes.—Sixth and seventh deaths.

134 minutes.—Eighth death.

142 minutes.—Ninth death. Concentration 1.53 volume percent.

204 minutes.—Chamber opened, one pig still gasping 100 breaths per minute, pulse 158 beats per minute, rectal temperature 30.4° C. Death occurred at least 2 hours after the end of the exposure.

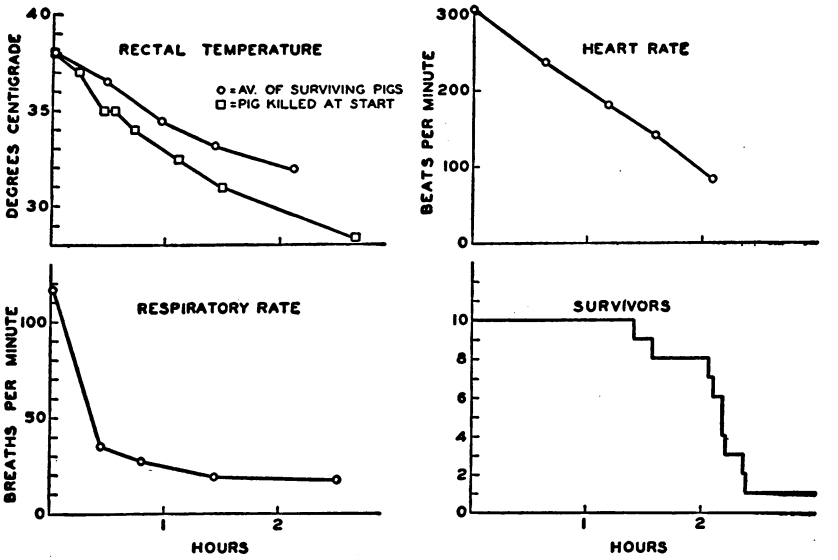

FIGURE 2.—Responses of guinea pigs to 1.68 volume percent (average) hexone vapor. All points are average values of survivors and therefore subject to vertical displacement due to the death of pigs with lower values. The survival chart will help in making interpretations.

DISCUSSION

The temperature of the dead pig introduced into the chamber fell off characteristically (fig. 2) and only a little faster than the average temperature of the anaesthetized pigs. This indicates that impairment of the metabolism was quite severe (4). The heart rate fell similarly from an estimated value of 300 to 85 beats per minute and it was observed that considerable irregularity in beat became manifest toward the end of the experiment. The respiratory rate fell off very abruptly from about 117 breaths per minute to 35 and less, which represents a spasmodic, gasping action.

The curves indicating the course of these data are presented in figure 2 with respect to survivors only. Therefore, some distortion of the final points occurs since a considerable variation normally exists and the pigs with high rates survive into the next period.

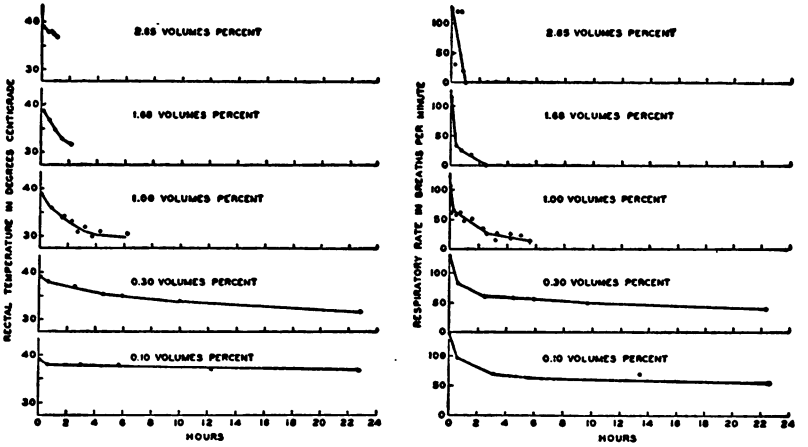

FIGURE 3.—Response of rectal temperature and respiratory rate to inhalation of hexone at various concentrations.

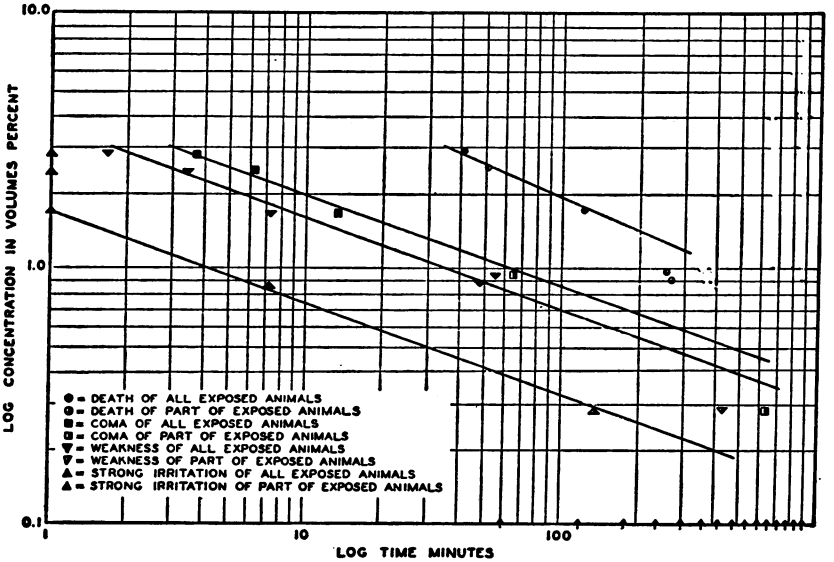

FIGURE 4.—Relation of concentration of hexone vapor and time of exposure to various acute responses of guinea pigs. Average values are plotted throughout. The partially filled points represent incomplete reaction of all pigs in the exposed group.

It will be evident from a study of figure 3, showing rectal temperatures and respiratory rate, that there is a regular transition from highest to lowest concentration. This is true as well for all other data, as shown in figure 4.

In an atmosphere saturated at room temperature, about 25° C., hexone is present at about 3.0 to 2.5 volumes percent depending on the presence of water. In such an atmosphere the time course of the events listed above is considerably shortened so that the average time of death is 45 minutes, and few animals survive over 60 minutes (see fig. 4). The symptoms are the same, but the course of temperature fall is so short that the animals die before a great deal of heat is lost (see fig. 3). The decrease in respiratory rate is much more rapid than at lower concentrations and in many cases the change from the repressed type of breathing, due to irritation, to the gasping, due, presumably, to asphyxiation is extremely abrupt. A graphical representation of temperature and respiratory rate for each of five concentrations is given in figure 3.

In the lowest concentration used, approximately 0.1 volume percent, the vapor was still exceedingly irritating to the eyes and nose of the operator, yet the pigs showed little inconvenience and only slight effect on the maintenance of usual stance, reflexes, and temperature. It is obvious from figure 3 that the respiratory rate fell in the first 6 hours of exposure to a level suggesting a low grade narcosis. This is in accord with the general aspect of the animals; they were very quiet and sat hunched up. During the night between observations some climbed out of their cages, seeking the warmth of the other pigs. The taking of rectal temperatures became less and less troublesome, due to the evident relaxation of the anal sphincter. The temperature, as indicated above, was maintained very well in view of our experience with normal animals in which variations of several degrees are to be expected with changes in environmental temperature (see also (*5*), p. 154).

Animals which succumbed to exposures were autopsied and microscopic investigations were made in several cases to ascertain any marked effects. Gross changes were slight and mainly in the direction of congestion, especially in the brain and lungs. Microscopical study [2] indicated a fine droplet fatty metamorphosis in many liver cells, but most cells were normal and many sections of the liver showed no pathology at all. The kidneys and heart showed no abnormalities, but the spleen showed some congestion and hypertrophy. The brain and lungs showed no changes other than a slight congestion.

Survivors of the exposure have not indicated any gross pathology other than that found in the controls, and the deaths are attributable to a pulmonary affection common to laboratory animals. It is probable that the low body temperatures attained in the longer exposures are in themselves a predisposing factor to the development of a lung infection.

[2] Microscopical study was made by Acting Assistant Surgeon J. W. Miller.

Since we are concerned mainly with acute effects, no investigation of latent or chronic effects was planned, but the survivors of the exposure were observed for several months and autopsies performed on the pigs that died subsequently. No significant results have appeared in relation to the exposures.

In comparison with acetone it is evident that hexone has the common property of narcosis. Most authors agree that the ketones are only slightly toxic in acute exposures and that their effects are due mainly to the degree of narcosis which develops (*6*, *7*).

SUMMARY AND CONCLUSIONS

Methyl isobutyl ketone vapor inhalation causes irritation of conjunctival and nasal mucosa in man at concentrations below 0.1 volume percent, although this concentration is well tolerated by guinea pigs. This indicates good warning qualities. At higher concentrations marked irritation is exhibited by guinea pigs as evidenced by lacrimation and salivation. A progressive narcosis occurs, causing lowering of body temperature, respiratory rate, and heart rate. A loss of static control, consciousness, and the deeper reflexes follows. Death finally ensues at 1.0 volume percent in about 4 hours and in progressively shorter periods at higher concentrations. Complete recovery can be effected by removal at any but the terminal stages. Gross and microscopic pathology is slight and resembles that of most acute reactions to solvent exposures.

ACKNOWLEDGMENTS

Acknowledgment is made to Passed Asst. Surg. B. F. Jones for assistance in devising the experimental procedure and consultations concerning the prosecution of the work. The technical assistance of W. H. Reinhart and Peter J. Valaer, and the construction of the charts by Mrs. M. W. Hertford are also gratefully acknowledged.

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A NOTE ON THE QUALITY OF DRINKING WATER ON TRAINS

By ARTHUR P. MILLER, *Sanitary Engineer*, and EDMUND C. GARTHE, *Junior Sanitary Engineer, U. S. Public Health Service*

From September 14, 1936, to February 15, 1937, 1,090 samples of drinking water were collected from coolers and other containers on trains operating in interstate traffic by trained collectors under the supervision of Interstate Sanitary District No. 1 at two large terminals in New York City and three smaller ones in Hoboken and Jersey City, N. J.

The purpose of this work was to determine, in a relative way, whether the sanitary measures in vogue and the protective devices employed in the terminals were effective in protecting the quality of the water during its passage from the mains of the municipality supplying it to the hands of the consumers on the trains. It was assumed

that if a carrier did not adequately care for and protect its car-watering facilities against contamination, or if it failed thoroughly to cleanse the storage facilities on the cars at sufficient intervals, those facts would be reflected in the quality of the water as secured from the coolers and other containers. However, it was felt that this assumption could be confirmed in a sound fashion only if enough samples were secured so that idiosyncrasies in sampling would be of insignificant weight in the drawing of the conclusions.

Samples were taken from all types of cars without any attempt to be selective. In the same way, there was no choice made of trains; but all trains which could be conveniently reached during working hours on the days samples were collected were entered regardless of whether they were preparing to leave the terminal, were entering it as a final destination, or were passing through to other points. No effort was made to secure absolute information regarding the source or sources of the water in a container at the time of sampling, as such information would have been indefinite and would have been of no use in assisting to formulate the conclusions sought.

All the samples were tested in a laboratory under the supervision of this station by personnel trained so that their methods and technique would be comparable. The Standard Methods of Water Analysis of the American Public Health Association (8th edition, 1936) was followed in the laboratory work, and all tests were carried through the completed stage. Five 10-cc portions of each sample were planted.

Because the samples taken in no way came from a single source of supply, the Treasury Department Standards for Drinking Water could not be applied to the results. It was possible, therefore, only to evaluate the results secured on each railroad's series of samples by comparing them with those that would be obtained on samples of water free of contamination and with the results of the tests on each other railroad's series. Only in this way could an opinion be drawn as to the quality of the work done by one railroad as against that of another. It was further decided that any samples showing 3 or more 10-cc tubes positive for the *coli-aerogenes* group would be considered as unsatisfactory. Along with the determination of organisms of this group the total bacteria per ml growing on agar at 37° C. was obtained. It was thought that these might be useful for comparing with the trends of the *coli-aerogenes* determinations and as a measure of cleanliness. At no time did more than 2 hours elapse between the collection and testing of a sample.

An attempt was made to correlate the results with the type of car from which the samples were taken, but this was not fruitful of results. It is interesting to note, however, that one of the lines from which a large number of samples was secured was, with its more intimate

knowledge of the cars sampled, able to show a correlation between unfavorable results and one particular car design.

The following table gives all of the results tabulated in the fashion found to be most useful to the authors:

Railroad	Number of samples collected	Percentages of samples showing 3 or more 10-cc tubes positive for coli-aerogenes	Percentages of samples examined resulting in total bacteria per ml on agar at 37° C. of—		
			100 to 999	1,000 and over	100 and over
1	190	12.1	28.6	37.8	66.4
2	296	2.0	35.0	15.4	50.3
3	157	15.9	27.8	37.1	64.9
4	28	7.1	22.2	14.8	37.0
5	150	.7	16.1	8.7	24.8
6	78	1.3	24.3	11.5	35.9
7	26	0	23.1	30.8	53.8
8	30	3.3	13.3	56.6	70.0
9	135	3.0	18.5	20.7	39.3
Total and average	1,090	5.8	26.1	23.3	49.4

It will be noted that the percentages of samples showing 3 or more 10-cc tubes positive for coli-aerogenes for railroads 1 and 3 are considerably higher than for all others except 4, and that the percentages of all three of these roads are in excess of the average for all samples tested, two of them considerably so. The total numbers of bacteria per ml were so inconsistent among themselves and as related to the coli-aerogenes determinations that they were not used in arriving at conclusions.

It is known that the sources of water supplying these lines are satisfactory, and that if the water is safely handled it should reach the consumers in good condition. Therefore, these results indicate that at least two of the railroads are inefficiently cleaning the containers on their cars or are handling the water after it leaves the supplying municipality's system in such a careless and insanitary fashion as to permit contamination.

When it is possible to secure a large number of samples from the cars of one railroad, it is believed that this scheme has merit in determining roughly which railroads are giving sufficient attention to railroad and terminal sanitation and which are not. In this way, this kind of work is helpful as an adjunct to field investigations of sanitary measures in vogue at railroad terminals or watering points.

SUMMARY

Bacteriological tests made on 1,090 samples of drinking water collected from containers on all types of cars operated by 9 different railroads having terminals in or adjacent to New York City indicated that at least 2 of these railroads were inefficiently cleaning their

storage containers or contaminating the water by handling it in a careless and insanitary fashion during the process of transferring it from the sources of supply to the containers.

DEATHS DURING WEEK ENDED FEBRUARY 5, 1938

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

	Week ended Feb. 5, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,049	[1] 10,319
Average for 3 prior years	9,788	
Total deaths, first 5 weeks of year	45,719	54,488
Deaths under 1 year of age	538	[1] 636
Average for 3 prior years	610	
Deaths under 1 year of age, first 5 weeks of year	2,697	3,247
Data from industrial insurance companies:		
Policies in force	69,801,473	69,123,600
Number of death claims	13,870	15,233
Death claims per 1,000 policies in force, annual rate	10.4	11.5
Death claims per 1,000 policies, first 5 weeks of year, annual rate	10.1	11.7

[1] Data for 85 cities.

PREVALENCE OF DISEASE

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

UNITED STATES

CURRENT WEEKLY STATE REPORTS

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

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937
New England States:								
Maine	1	4	11	499	155	28	0	0
New Hampshire	------	------	4	57	91	44	0	0
Vermont	------	------	------	------	300	1	0	1
Massachusetts	2	6	------	------	204	1,006	2	3
Rhode Island	------	1	------	------	2	179	2	0
Connecticut	4	1	4	438	16	340	0	0
Middle Atlantic States:								
New York	30	34	[1] 18	[1] 50	673	288	4	12
New Jersey [2]	19	13	7	54	1,000	464	1	3
Pennsylvania	64	44	------	------	6,866	145	7	14
East North Central States:								
Ohio	35	20	------	1,298	1,808	21	3	3
Indiana	43	5	12	172	516	4	5	4
Illinois	32	36	24	239	4,848	37	4	12
Michigan [2]	26	13	2	24	1,902	58	1	4
Wisconsin	3	1	28	632	2,180	22	0	4
West North Central States:								
Minnesota	2	1	4	14	9	20	1	1
Iowa	11	6	8	90	55	2	2	1
Missouri	22	10	162	1,573	848	4	1	3
North Dakota	1	1	6	207	15	------	1	6
South Dakota	------	------	------	29	------	1	0	1
Nebraska	5	4	------	7	12	21	0	0
Kansas	12	5	24	698	417	6	1	2
South Atlantic States:								
Delaware	------	1	------	6	24	102	0	1
Maryland [2]	17	12	20	394	35	385	2	6
District of Columbia	10	6	1	53	11	32	1	0
Virginia	24	16	------	------	633	163	10	10
West Virginia	7	20	46	1,510	323	8	3	4
North Carolina [2]	27	24	38	115	1,662	61	3	4
South Carolina [2]	2	8	645	1,135	375	32	1	0
Georgia [2]	11	12	------	827	327	------	1	1
Florida [2]	12	5	------	5	409	4	2	10
East South Central States:								
Kentucky	12	6	38	376	450	36	6	6
Tennessee	18	16	168	837	824	182	1	5
Alabama [2]	13	8	331	920	846	8	9	4
Mississippi [2]	8	4	------	------	------	------	1	1
West South Central States:								
Arkansas	10	5	235	1,048	302	------	3	15
Louisiana	5	7	44	228	------	1	1	0
Oklahoma [4]	18	4	284	1,342	60	15	1	3
Texas [2]	30	51	940	3,624	167	330	5	9

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937
Mountain States:								
Montana	----	7	----	403	5	7	1	2
Idaho	1	----	5	134	5	88	0	0
Wyoming	1	----	----	----	13	----	0	0
Colorado	11	1	----	----	554	----	0	0
New Mexico	7	----	1	406	76	29	0	0
Arizona	7	3	168	969	3	156	1	3
Utah [2]	----	1	----	----	81	24	0	0
Pacific States:								
Washington	4	2	4	11	22	61	0	3
Oregon	2	1	76	770	17	8	1	0
California	27	25	111	6,087	185	89	1	17
Total	646	450	3,469	27,231	29,326	4,512	89	178
First 6 weeks of year	4,055	3,574	18,420	168,977	132,262	26,282	552	883

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938
New England States:									
Maine	0	0	11	25	0	0	0	1	61
New Hampshire	0	0	7	13	0	0	0	0	6
Vermont	0	0	21	16	0	0	0	0	21
Massachusetts	0	1	308	235	0	0	1	0	158
Rhode Island	0	0	31	63	0	0	1	0	25
Connecticut	0	0	97	97	0	0	0	1	48
Middle Atlantic States:									
New York	0	1	690	746	0	5	2	5	385
New Jersey [2]	0	0	115	164	0	0	1	4	158
Pennsylvania	0	0	472	834	0	0	4	8	261
East North Central States:									
Ohio	0	1	472	313	67	1	1	3	120
Indiana	0	0	188	160	42	2	0	0	16
Illinois	1	0	805	622	41	11	1	3	105
Michigan [2]	1	1	497	733	6	3	19	1	208
Wisconsin	0	0	206	361	4	2	1	0	152
West North Central States:									
Minnesota	0	0	150	136	26	8	0	0	45
Iowa	0	1	251	291	41	33	1	1	17
Missouri	0	0	202	288	27	98	3	2	90
North Dakota	0	0	----	73	11	57	0	1	15
South Dakota	0	1	23	60	9	6	2	0	25
Nebraska	0	0	53	108	5	5	0	1	7
Kansas	0	1	267	314	32	45	1	0	105
South Atlantic States:									
Delaware	0	0	16	2	0	0	0	0	7
Maryland [2]	0	0	83	49	0	0	0	0	71
District of Columbia	0	0	15	17	0	0	0	0	12
Virginia	0	0	56	31	1	1	1	4	78
West Virginia	0	0	50	49	0	0	5	1	62
North Carolina [2]	0	1	50	57	2	0	3	2	385
South Carolina [2]	0	0	2	6	0	0	5	2	61
Georgia [2]	2	0	14	12	0	0	5	3	72
Florida [2]	0	3	10	7	0	0	0	2	6
East South Central States:									
Kentucky	4	1	68	24	35	0	0	3	64
Tennessee	0	1	54	27	10	0	3	6	74
Alabama [2]	0	1	22	16	1	5	3	1	16
Mississippi [2]	5	1	8	8	2	0	0	9	----

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938
West South Central States:									
Arkansas	0	3	15	17	10	1	6	1	54
Louisiana	0	0	14	10	0	0	12	5	19
Oklahoma [4]	0	1	47	27	27	1	2	3	39
Texas [3]	1	1	169	109	25	5	20	3	261
Mountain States:									
Montana	1	0	34	54	12	23	0	1	16
Idaho	0	0	17	0	28	3	2	0	8
Wyoming	0	0	18	12	9	4	0	0	19
Colorado	0	0	80	42	5	0	1	0	12
New Mexico	0	0	38	25	0	0	6	3	37
Arizona	0	0	22	28	0	0	0	0	45
Utah [2]	0	0	66	16	6	0	0	0	46
Pacific States:									
Washington	0	0	61	62	48	16	0	1	167
Oregon	1	0	80	20	30	11	1	2	28
California	2	0	171	274	37	25	6	4	271
Total	18	20	6,146	6,662	599	371	117	87	3,958
First 6 weeks of year	124	141	35,937	36,535	3,618	1,828	707	698	23,904

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 12, 1938, 25 cases, as follows: North Carolina, 1; South Carolina, 1; Georgia, 7; Florida, 4; Alabama, 2; Texas, 10.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

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

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
December 1937										
Alaska	-------	-------	7	-------	1	-------	0	-------	0	0
January 1938										
Arkansas	3	68	682	49	630	6	4	52	55	8
District of Columbia	3	37	12	-------	49	-------	0	83	0	4
Florida	15	74	27	13	479	4	2	41	7	13
Georgia	6	63	956	345	1,234	50	2	78	4	10
Tennessee	20	82	863	15	1,962	11	5	188	20	15
Wyoming	-------	4	-------	-------	16	-------	0	67	15	0

December 1937

	Cases
Alaska:	
Chickenpox	48
Impetigo contagiosa	2
Mumps	136
Whooping cough	9

January 1938

	Cases
Anthrax:	
Arkansas	2
Chickenpox:	
Arkansas	102
District of Columbia	285
Florida	159
Georgia	294

January 1938—Continued

	Cases
Chickenpox—Continued.	
Tennessee	369
Wyoming	112
Conjunctivitis, infectious:	
Georgia	7
Dengue:	
Florida	2
Dysentery:	
Arkansas (amoebic)	1
Arkansas (bacillary)	4
District of Columbia (amoebic)	1
Florida (amoebic)	2
Georgia (amoebic)	6
Georgia (bacillary)	4

January 1938—Continued

	Cases
Dysentery—Continued.	
Tennessee (amoebic)	2
Tennessee (bacillary)	3
Encephalitis, epidemic or lethargic:	
District of Columbia	2
Tennessee	1
German measles:	
Arkansas	5
Tennessee	10
Hookworm disease:	
Arkansas	1
Florida	380
Georgia	1,596
Tennessee	1

Summary of monthly reports from States—Continued

January 1938—Continued

	Cases
Impetigo contagiosa:	
Tennessee	4
Mumps:	
Arkansas	26
Florida	56
Georgia	347
Tennessee	212
Wyoming	67
Paratyphoid fever:	
Georgia	1
Puerperal septicemia:	
Georgia	4
Tennessee	5
Rabies in animals:	
Arkansas	23
Florida	4

January 1938—Continued

	Cases
Rabies in man:	
Georgia	1
Septic sore throat:	
Arkansas	3
Georgia	40
Tennessee	71
Tetanus:	
Florida	4
Georgia	1
Trachoma:	
Arkansas	7
Tularaemia:	
Arkansas	6
Florida	1
Georgia	5
Tennessee	9

January 1938—Continued

	Cases
Typhus fever:	
Florida	2
Georgia	43
Tennessee	1
Undulant fever:	
Georgia	3
Tennessee	1
Vincent's infection:	
Florida	22
Tennessee	6
Whooping cough:	
Arkansas	176
District of Columbia	35
Florida	54
Georgia	152
Tennessee	151
Wyoming	49

CASES OF VENEREAL DISEASES REPORTED FOR DECEMBER 1937

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,407	4.86	310	1.07
Arizona [1]				
Arkansas	466	2.28	215	1.05
California	2,115	3.44	1,812	2.94
Colorado	45	.42	25	.23
Connecticut	225	1.29	127	.73
Delaware	238	9.11	57	2.18
District of Columbia	196	3.13	140	2.23
Florida	2,065	12.36	246	1.47
Georgia	1,007	3.26	937	3.04
Idaho	39	.79	37	.75
Illinois	1,650	2.09	1,037	1.31
Indiana	266	.77	66	1.89
Iowa [2]	307	1.20	183	.72
Kansas	233	1.25	82	.44
Kentucky	770	2.64	413	1.41
Louisiana	217	1.02	81	.38
Maine	56	.65	48	.56
Maryland	1,084	6.45	367	2.19
Massachusetts	475	1.07	495	1.12
Michigan	951	1.97	650	1.34
Minnesota	271	1.02	238	.90
Mississippi	1,499	7.41	2,162	10.68
Missouri	473	1.21	108	.27
Montana [2]	56	1.04	30	.55
Nebraska	70	.51	88	.65
Nevada [2]				
New Hampshire	18	.35	12	.24
New Jersey	867	2.00	350	.81
New Mexico	241	5.71	71	1.68
New York [2]	620	.48	720	.60
North Carolina	2,166	6.20	473	1.35
North Dakota [1]				
Ohio	1,448	2.15	457	.68
Oklahoma	403	1.58	382	1.50
Oregon	95	.93	196	1.91
Pennsylvania	1,998	2.00	214	.20
Rhode Island	117	1.71	53	.78
South Carolina [1]				
South Dakota	27	.40	14	.20
Tennessee	811	2.80	387	1.34
Texas	252	.41	162	.26
Utah	1	.02	9	.17
Vermont	17	.44	30	.78
Virginia	836	3.09	239	.98

See footnotes at end of table.

Reports from States—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Washington	501	3.02	380	2.29
West Virginia [2]	260	1.40	134	.72
Wisconsin [4]	81	.28	176	.60
Wyoming [5]	20	.85	14	.60
Total	26,960	2.14	14,427	1.14

Reports from cities of 200,000 population or over

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Akron, Ohio [1]				
Atlanta, Ga	244	8.49	180	6.26
Baltimore, Md	703	8.52	261	3.16
Birmingham, Ala	198	7.01	69	2.44
Boston, Mass	212	2.68	143	1.80
Buffalo, N. Y	218	3.68	74	1.25
Chicago, Ill	845	2.36	633	1.77
Cincinnati, Ohio [1]				
Cleveland, Ohio	287	3.08	104	1.11
Columbus, Ohio	111	3.63	24	.79
Dallas, Tex	196	6.76	111	3.83
Dayton, Ohio	59	2.81	11	.52
Denver, Colo. [1]				
Detroit, Mich	384	2.22	315	1.82
Houston, Tex. [6]	181	5.40	35	1.05
Indianapolis, Ind. [1]				
Jersey City, N. J. [1]				
Kansas City, Mo	25	.59	1	.02
Los Angeles, Calif	872	6.09	521	3.64
Louisville, Ky	413	12.75	123	3.79
Memphis, Tenn	158	5.92	74	2.77
Milwaukee, Wis. [1]				
Minneapolis, Minn. [1]				
Newark, N. J	278	6.00	113	2.43
New Orleans, La	77	1.61	46	.96
New York, N. Y. [1]				
Oakland, Calif	62	2.04	72	2.37
Omaha, Nebr	23	1.04	12	.54
Philadelphia, Pa	611	3.07		
Pittsburgh, Pa	284	4.15	21	.31
Portland, Oreg	82	2.61	114	3.63
Providence, R. I	62	2.39	28	1.08
Rochester, N. Y	35	1.04	47	1.39
St. Louis, Mo	324	3.87	146	1.74
St. Paul, Minn. [1]				
San Antonio, Tex. [1]				
San Francisco, Calif	141	2.10	247	3.68
Seattle, Wash	211	5.56	171	4.50
Syracuse, N. Y	83	3.81	63	2.89
Toledo, Ohio	107	3.51	29	.95
Washington, D. C. [7]	196	3.13	140	2.23

[1] No report for current month.
[2] Incomplete.
[3] Not reporting.
[4] Only cases of syphilis in the infectious stage are reported.
[5] From report submitted to Medical Director of Epidemiological Studies.
[6] Reported by Jefferson Davis Hospital.
[7] Reported by Social Hygiene Clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 5, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	223	1,492	182	3,348	1,009	2,024	27	408	20	1,168	----
Current week [1]	171	232	83	7,912	818	1,609	CO	351	17	916	----
Maine:											
Portland	0	----	1	5	1	5	0	4	0	14	31
New Hampshire:											
Concord	0	----	0	4	1	0	0	1	0	4	10
Manchester	0	----	0	0	0	1	0	0	0	0	5
Nashua	0	----	0	0	3	0	0	0	0	0	10
Vermont:											
Barre	----	----	----	----	----	----	----	----	----	----	----
Burlington	0	----	0	9	0	1	0	0	0	6	12
Rutland	0	----	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	----	0	116	21	79	0	9	1	23	225
Fall River	2	----	0	0	2	0	0	0	0	11	32
Springfield	0	----	0	0	4	3	0	0	0	3	36
Worcester	0	----	0	0	10	9	0	2	0	6	60
Rhode Island:											
Pawtucket	0	----	0	0	2	3	0	0	0	1	18
Providence	0	----	0	2	12	16	0	3	0	14	78
Connecticut:											
Bridgeport	0	2	1	0	1	15	0	1	0	1	39
Hartford	0	1	0	0	2	19	0	1	0	0	49
New Haven	0	----	0	1	3	6	0	0	0	6	49
New York:											
Buffalo	0	----	0	4	18	27	0	7	0	14	174
New York	32	16	3	221	137	282	0	78	4	170	1,549
Rochester	0	1	0	1	10	5	0	1	0	9	66
Syracuse	0	----	0	9	7	17	0	0	0	11	44
New Jersey:											
Camden	0	----	0	65	3	2	0	2	0	0	29
Newark	0	1	0	6	15	12	0	9	0	11	111
Trenton	0	----	0	32	1	6	0	2	0	2	28
Pennsylvania:											
Philadelphia	4	12	4	403	31	103	0	13	1	51	509
Pittsburgh	3	6	5	399	29	40	0	8	0	19	200
Reading	0	----	0	3	0	2	0	0	0	1	26
Scranton	2	----	----	50	----	2	0	----	0	2	----
Ohio:											
Cincinnati	2	3	2	0	12	7	7	10	0	3	157
Cleveland	2	12	2	114	14	57	0	12	0	37	194
Columbus	1	1	1	160	8	9	0	3	0	2	96
Toledo	2	1	1	128	4	5	1	4	0	9	68
Indiana:											
Anderson	0	----	0	2	3	2	10	0	0	0	10
Fort Wayne	1	----	0	17	3	14	0	0	0	0	29
Indianapolis	27	----	2	44	12	11	0	5	0	4	110
South Bend	1	----	0	0	5	2	1	0	0	0	21
Terre Haute	3	----	0	12	0	0	1	0	0	0	19
Illinois:											
Alton	0	----	0	0	1	3	0	0	0	0	10
Chicago	17	17	3	1,951	77	247	0	35	0	40	779
Elgin	2	----	1	1	3	13	0	0	0	1	18
Moline	0	----	0	51	3	13	0	0	0	2	11
Springfield	0	----	0	104	1	9	7	0	0	0	19
Michigan:											
Detroit	9	2	4	1,011	18	137	0	16	0	49	255
Flint	0	----	0	2	3	38	0	0	0	12	28
Grand Rapids	0	----	0	1	0	19	0	1	0	2	31
Wisconsin:											
Kenosha	0	----	0	3	0	5	0	0	0	5	11
Madison	0	----	0	1	2	5	0	0	0	1	6
Milwaukee	1	----	0	1,739	10	21	0	0	0	35	79
Racine	0	----	0	2	1	9	0	1	0	1	13
Superior	0	----	0	0	1	2	0	0	0	2	7

[1] Figures for Barre, Vt., and Wilmington, N. C., estimated; reports not received.

City reports for week ended Feb. 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	1	0	2	4	0	0	0	5	26
Minneapolis	0	------	3	2	2	24	0	1	0	1	101
St. Paul	0	------	0	3	9	8	8	2	0	0	59
Iowa:											
Cedar Rapids	0	------	--------	1	--------	2	1	--------	0	2	--------
Davenport	0	------	--------	17	--------	1	0	--------	0	0	--------
Des Moines	0	------	--------	1	--------	25	0	--------	1	0	45
Sioux City	0	------	--------	1	--------	4	0	--------	0	1	--------
Waterloo	1	------	--------	0	--------	13	0	--------	0	0	--------
Missouri:											
Kansas City	1	------	2	130	15	22	0	6	0	9	122
St. Joseph	0	------	0	2	3	0	0	1	0	0	39
St. Louis	9	------	2	95	10	65	2	3	0	5	241
North Dakota:											
Fargo	0	------	0	1	2	4	0	0	0	6	8
Grand Forks	0	------	--------	0	--------	3	0	--------	0	0	--------
Minot	1	------	0	0	0	0	5	0	0	6	13
South Dakota:											
Aberdeen	2	------	--------	0	--------	0	0	--------	0	4	--------
Sioux Falls	0	------	0	0	0	2	0	0	1	0	9
Nebraska:											
Lincoln	1	------	0	1	0	6	0	0	0	2	12
Omaha	0	------	0	1	8	3	1	0	0	2	62
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	1	8
Topeka	0	------	0	3	7	4	0	0	0	18	31
Wichita	2	------	0	1	5	7	0	0	0	3	28
Delaware:											
Wilmington	0	------	0	7	5	4	0	0	0	10	22
Maryland:											
Baltimore	7	7	2	5	32	22	0	12	1	35	222
Cumberland	0	------	1	0	0	1	0	0	0	0	10
Frederick	0	------	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	5	3	2	13	27	21	0	13	0	9	208
Virginia:											
Lynchburg	4	------	0	0	3	1	0	0	0	1	13
Norfolk	2	------	0	60	5	10	0	3	0	2	38
Richmond	0	------	0	33	11	1	0	2	0	0	58
Roanoke	2	------	1	3	2	1	0	1	0	1	18
West Virginia:											
Charleston	1	1	0	131	13	1	0	1	0	1	40
Huntington	2	------	--------	7	--------	2	0	--------	0	0	--------
Wheeling	0	------	0	12	0	1	0	2	0	14	16
North Carolina:											
Gastonia	0	------	--------	0	--------	0	0	--------	0	9	--------
Raleigh	0	------	0	2	0	1	0	0	0	19	5
Wilmington	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Winston-Salem	0	------	0	2	4	1	0	0	0	24	12
South Carolina:											
Charleston	0	49	0	172	5	1	0	0	0	0	25
Columbia	0	------	0	0	8	0	0	1	0	0	21
Greenville	0	------	0	0	0	1	0	0	0	11	5
Georgia:											
Atlanta	1	18	5	181	12	5	0	3	0	7	97
Brunswick	0	------	0	0	1	0	0	0	0	0	3
Savannah	0	18	0	3	5	1	0	3	1	0	33
Florida:											
Miami	0	1	0	89	4	0	0	1	0	6	34
Tampa	2	0	0	1	2	0	0	1	0	0	--------
Kentucky:											
Ashland	0	4	--------	0	4	0	0	3	0	2	44
Covington	0	2	0	0	2	0	0	1	0	1	10
Lexington	0	------	0	2	3	0	0	1	0	0	19
Louisville	0	14	0	182	10	40	9	3	0	8	80
Tennessee:											
Memphis	0	------	4	250	16	2	0	9	1	4	89
Nashville	1	------	3	17	8	6	0	0	0	0	65
Alabama:											
Birmingham	0	8	3	44	4	3	0	4	0	0	63
Mobile	1	1	1	4	3	0	0	1	1	0	22
Montgomery	0	4	--------	12	--------	0	0	--------	0	0	--------

City reports for week ended Feb. 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0			1		0	0		0	1	
Little Rock	0		1	60	3	0	0	0	1	2	
Louisiana:											
Lake Charles	0		0	0	0	0	0	0	0	2	2
New Orleans	7	11	8	0	23	6	0	13	1	0	182
Shreveport	0		1	0	5	6	0	2	1	0	34
Oklahoma:											
Muskogee	0			0		0	0		0	0	
Oklahoma City	0		2	5	6	3	0	0	0	0	45
Tulsa	0			2		3	1		0	8	
Texas:											
Dallas	3	3	2	1	8	15	0	7	1	5	73
Fort Worth	1		1	0	7	10	0	3	0	0	51
Galveston	0		0	0	1	3	0	0	1	0	18
Houston	6		1	1	17	3	0	5	1	3	98
San Antonio	0		3	1	15	2	0	7	0	1	76
Montana:											
Billings	0		0	1	2	1	0	1	0	0	9
Great Falls	0		0	0	0	1	1	0	0	13	5
Helena	0		0	0	1	0	0	0	0	0	4
Missoula	0	1	1	0	1	0	0	0	0	0	9
Idaho:											
Boise	0		0	0	1	0	10	0	0	0	8
Colorado:											
Colorado Springs	0		0	1	1	3	0	2	0	2	11
Denver	3		1	244	8	27	0	3	0	1	81
Pueblo	1		0	2	1	3	0	0	0	1	10
New Mexico:											
Albuquerque	1		0	6	0	2	0	0	0	3	14
Utah:											
Salt Lake City	0		2	25	2	19	3	0	0	2	39
Washington:											
Seattle	2		1	0	5	9	0	2	0	53	98
Spokane	0		0	2	4	2	1	1	0	6	40
Tacoma	0		0	0	2	6	0	0	0	26	25
Oregon:											
Portland	2	1	1	0	9	23	1	1	0	2	83
Salem	0	4		0		0	0		0	0	
California:											
Los Angeles	6	29	3	10	20	43	18	16	0	7	325
Sacramento	0		0	1	2	0	0	2	0	15	33
San Francisco	2	7	1	1	5	13	0	6	1	38	149

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
New York:			
Buffalo	1	2	0
New York	8	5	1
Pennsylvania:			
Scranton	1	0	0
Ohio:			
Cleveland	3	0	0
Illinois:			
Chicago	2	0	0
Michigan:			
Detroit	0	0	1
Iowa:			
Des Moines	1	0	0
Missouri:			
Kansas City	0	1	0
West Virginia:			
Charleston	2	2	0
South Carolina:			
Greenville	1	0	0
Kentucky:			
Louisville	2	0	0
Louisiana:			
Shreveport	0	1	0
Oklahoma:			
Tulsa	0	0	1
Texas:			
San Antonio	0	1	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1.
Pellagra.—Cases: Baltimore, 1; Washington, 1; Charleston, S. C., 4; Atlanta, 1; Savannah, 3; Louisville, 1; San Francisco, 2.
Typhus fever.—Cases: Savannah, 2; San Antonio, 1.

FOREIGN AND INSULAR

DOMINICAN REPUBLIC

Vital statistics—Year 1936.—Following are the numbers of deaths from certain causes and rates per 100,000 population in the Dominican Republic for the year 1936:

Disease	Number	Rate per 100,000 population	Disease	Number	Rate per 100,000 population
Appendicitis	22	1.47	Influenza	123	8.19
Cancer and other malignant tumors	193	12.85	Leprosy	4	.27
Cerebral hemorrhage	95	6.33	Malaria	1,280	85.24
Cirrhosis of the liver	20	1.33	Measles	2	.13
Congenital debility	20	1.33	Nephritis (acute)	7	.47
Diabetes	8	.53	Nephritis (chronic)	83	5.52
Diarrhea and enteritis (under 2 years)	416	27.71	Pneumonia (lobar)	778	51.81
Diphtheria	28	1.87	Smallpox	4	.27
Dysentery	114	7.59	Suicide	10	.67
Erysipelas	3	.20	Syphilis	121	8.06
Hernia	1	.07	Tetanus	549	36.56
Hookworm disease	43	2.86	Tuberculosis (all forms)	958	63.80
			Typhoid fever	288	19.18
			Whooping cough	5	.33

SWEDEN

Notifiable diseases—December 1937.—During the month of December 1937, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Poliomyelitis	[1] 65
Diphtheria	39	Scarlet fever	1,859
Dysentery	42	Syphilis	25
Epidemic encephalitis	2	Typhoid fever	10
Gonorrhea	829	Undulant fever	11
Paratyphoid fever	4	Weil's disease	2

[1] Includes 3 cases nonparalytic at time of notification.

39649°—38——3

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

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

CHOLERA

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15	22	29
China:																		
Canton	C	62	80	102	14													
Hangchow	C			12	[1] 41													
Hoihow	C	100																
Hong Kong	C	7	964	580	84	4	1	1	1					1		1		
	D	7	497	344	63	3	1	3								1		
Kwangchow Wan	C		104		62	4	8											
	D		81		26	4	6											
Macao	C		286	190	27	1		1										
Manchuria:																		
Dairen	C				6													
Kwantung Leased Territory	C			3														
Mukden	C				2													
Nanking	C				120													
	D				14													
Shanghai	C		8	1,804	1,414	67	81	49	40	6	10	3	3	3				
Swatow	C		8	24	44	24	19	42	16	2								
Tientsin	C				8													
Chosen: Fusan	C			1														
Dutch East Indies:																		
Celebes	C			[2] 6														
Macassar	C															1		

[1] For 2 weeks.
[2] El Tor strain.

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

CHOLERA—Continued

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15	22	29
Federated Malay States	D	2																
India	C	13,893	18,259	12,203	11,344	1,029	1,803	2,168	1,799	1,664	1,563	1,245						
	D	6,495	7,976	5,768	5,787	495	1,046	1,172	1,024	835	831	569						
Assam	C	63	35	44	59	13	39	19	16	6	68	40	25	35	45	88	53	41
	D	34	25	16	25	11	23	13	6	1	13	24	18	22	22	40	34	23
Bassein	C	1																
Bombay Presidency	C	2,936	4,273	3,366	1,375	122	106	104	31	49	42	53	47	7	2			
	D	1,098	1,719	1,571	686	51	50	53	17	28	19	35	35	6	1			
Bombay	C	[3]1		[3]1														
Calcutta	C	92	77	56	53	19	21	18	22	19	23	15	12	6	23	24	36	33
Central Provinces and Berar	C	62	176	286	860	79	93	102	82	36	27	19	31	18	4	6	12	
Chittagong	C	5																
Delhi	C					1												
Madras Presidency	C	2,794	4,210	1,844	826	239	290	411	264	374	1,020	402	858					
	D	1,182	1,659	771	389	83	110	150	88	135	480	174	389					
Madras	C	16	64	70	106	32	61	44	96	52	29	30	49	38	32	24	10	16
	D	6	26	18	43	7	9	4	14	12	13	8	7	6	7	3	8	5
Negapatam	C		1	3	1													
	D	1		1														
Northwest Frontier Province	C		203	32	19													
Orissa Province	C	295	247	111	147	12	43	26	10	20	11	7	1	12	12	12	21	
Punjab	C	24	120	29														
Rangoon	C								1					1				
Sind State	C		1	1														
India (French):																		
Chandernagor Territory	C	2			4	2	1	1		1								
Karikal Province	C			1														
Pondichery Province	C			1	1							1						

Indochina (French): [4]																		
Annam Province	C				37	173	191			40	18	31	5	5	20	12	7	19
Tonkin Province	C			320	4,179	1,074	1,268			274	69	82	84	15	26	7	2	9
Haiphong	C			56	577	16	12	10	6	1								
	D			30	159	18	9											
Hanoi	C				284	83	95	106	77	21	8	8	2		3			
Japan: [5]																		
Hiroshima	C			32	5													
Kobe	C				1													
Okayama Prefecture	C				5													
Taku	C			1	3													
Tokuyama	C				10													
Tokyo	C				1													
Siam: [6]																		
Bangkok	C	5	1		2													
Provinces	C	151	42	16	7													

On vessels:

S. S. *Talamba* at Port Swettenham from Madras	2 cases	June	27, 1937
S. S. *Chungking* at Bangkok from Hoihow	1 case	July	15, 1937
S. S. *Kwantung* at Hong Kong from Hoihow	1 case	July	21, 1937
S. S. *Kiangsu* [7] at Singapore from Hong Kong	1 case	July	22, 1937
S. S. *Eagle* at Hong Kong from Kongmoon	1 case	July	27, 1937
S. S. *Muinam* at Singapore from Hong Kong	2 cases	Aug.	16, 1937
S. S. *Sandviken* at Hong Kong	Present	Aug.	18, 1937
S. S. *Haiching* at Hong Kong	Present	Do.	
S. S. *Talma* at Singapore from Hong Kong	1 case	Aug.	20, 1937

On vessels—Continued.

S. S. *Cremer* at Singapore from Amoy, Hong Kong, and Swatow	1 case	Aug.	24, 1937
S. S. *Tyndareus* at Kobe from Hong Kong and Dairen	1 case	Aug.	27, 1937
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug.	31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept.	10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept.	15, 1937
S. S. *Kiungchow* at Hong Kong from Shanghai	3 cases	Oct.	3, 1937
S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec.	13, 1937

[3] Imported.

[4] For reports prior to June 27, 1937, see previous issues of PUBLIC HEALTH REPORTS.

[5] A report states that up to Sept. 30, cholera was reported in Japan, as follows: Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death.

[6] During the week ended Feb. 5, 1938, 3 fatal cases of cholera were reported in Nagara Nayok Province, Siam.

[7] In addition, for week ended July 28, 3 cases with 2 deaths in contacts.

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

PLAGUE[1]

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15	22	29
Algeria: Algiers	C	1																
Argentina. (See table below.)																		
Belgian Congo	C				[2]2								2					
Bolivia: Tarija Department	C																	50
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	42	16	11	15	7		3										
Tanganyika	C		1															
Uganda	C	47	32	50	51	28	12	17	10	14	6	10	5	5	6			
	D	43	32	48	40	20	12	14	10	12		10	8	5	6			
Ceylon:																		
Colombo	C		1		1				1		1			1				
	D		1		1				1		1				1			
Plague-infected rats		1		2	3													
China: [3]																		
Dutch East Indies:																		
Java and Madura	C	226	215	213	223	74	72	72										
	D	224	215	212	220	74	72	72										
Pasoeroean (vicinity of)	C	1				3		1	1	2								
Ecuador (see also table below):																		
Colimes	C														1			
Guayaquil	C		1		2						1		1		1	1	1	1
	D	1	1		2						1				1	1		
Plague-infected rats		2	2	1	2			3		1			1					
Parroquia Eloy Alfaro	C								1									
Egypt:																		
Asyut Province	C					1								1				
Beheira Province	C											1						
Gharbiya Province	C																1	
Girga Province	C				1													
Hawaii Territory: [4] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector [4]			8	4	8			1	3	7			1	1				
Honokaa Sector		8																
Paauhau Sector		1	1	1	1		3		2				2		1	2	3	2
Pauuilo										2	13	3						

Maui Island:																		
Makawao District—Plague-infected rats										1	3	2						
Omaopio [4]			1															
Wailuku District—Puunene	D													1				
India	C	558	962	1,697	1,996	465	364	470	575	440	400	391						
	D	356	522	747	821	187	188	159	208	215	175	164						
Bassein	C	1	2	2										1				[5]1
Plague-infected rats		1																
Bombay Presidency	C	33	43	62	82	20	11	16	12	15	10	10	16	8				
	D	20	25	42	48	9	11	8	8	17	8	4	8	4				
Central Provinces and Berar	C	10	85	285	582	120	84	183	205	109	147	80	54	36	91	58	113	188
Cochin	C			2		1												
Karachi	C			12														
Madras Presidency	C	106	203	111	80	43	45	74	13	23	52	16	69					
	D	63	98	59	41	20	23	28	13	13	28	5	38					
Punjab	C		17															
Rangoon	C	[5]2	5															
Sind State	C			8														
Indochina (French) (see also table below): Sadec	C	1		1														
Madagascar. (See table below.)																		
Peru. (See table below.)																		
Senegal:																		
Dakar	C	1		1														
Tivaouane	C	1																
Tunisia: Tunis	C	2																
Plague-infected rats		1										1						
Union of South Africa	C			[6]1	[6]1													
United States: [7]																		
California: [7 8 9]																		
Eldorado County—Plague-infected fleas.																		
Fresno County [8]	C			1														
Plague-infected fleas.																		
Plague-infected ground squirrels				3														
Placer County [9]—Plague-infected fleas.																		
San Bernardino County—Plague-infected fleas.																		
San Mateo County—Plague-infected fleas, lice, and ticks.																		
Idaho: [7] Bannock County—Plague-infected fleas and ticks.																		
Montana:																		
Beaverhead County — Plague-infected ground squirrel		1																
Madison County—Plague-infected squirrels			2															
Nevada: [7]																		
Douglas County—Plague-infected fleas.																		
Ormsby County—Plague-infected fleas and lice.																		
Utah: [7]																		
Morgan County—Plague-infected fleas.																		
Wasatch County—Plague-infected ground squirrel			1															

See footnotes at end of table.

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

PLAGUE—Continued

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

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
Argentina:							
Cordoba Province	C	--------	--------	1	--------	--------	--------
Mendoza Province	C	[10] 9	--------	--------	--------	--------	--------
Salta Province	C	--------	[10] 1	--------	--------	--------	--------
Santiago del Estero Province	C	[10] 6	--------	--------	--------	--------	--------
Brazil:[11] Pernambuco State	C	--------	5	--------	--------	5	--------
Indochina (French) (see also table above):							
Cambodia	C	2	--------	--------	--------	--------	--------
Cochinchina	C	2	--------	1	--------	--------	--------
Madagascar (central region)	C	25	22	48	59	67	--------
	D	24	22	47	59	65	--------
Peru	C	7	3	5	9	12	6
Ancash Department	C	--------	--------	--------	--------	3	--------
Lambayeque Department	C	1	2	2	1	--------	--------
Libertad Department	C	4	1	--------	2	1	--------
Salaverry	C	3	--------	--------	--------	--------	--------
Lima Department	C	2	--------	3	6	8	6

[1] Including plague in the United States and its possessions.
[2] Includes 1 case of pneumonic plague.
[3] Plague has been reported in China as follows: Information dated Aug. 18 reports an outbreak in West Hsingan (Khingan) and Southern Lungkiang Provinces. Information dated Sept. 2 states that 115 cases and 105 deaths occurred in Manchuria.
[4] Plague has also been reported in Hawaii Territory as follows: Week ended Aug. 14, 1937, 1 lot of 5 rats and 1 lot of 3 mice, by mass inoculation in Hamakua Mill Sector; week ended Nov. 20, 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island.
[5] Imported.
[6] For 2 weeks.
[7] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7–Nov. 5; San Bernardino County, July 12–Sept. 8; San Mateo County, July–Aug. 27. *Idaho*—Bannock County, July 8. *Nevada*—Douglas County, July 29–31; Ormsby County, July 2–Aug. 20. *Utah*—Morgan County, reported Aug. 10.
[8] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.
[9] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County, Calif.
[10] Pneumonic plague.
[11] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death. Pernambuco State, 23 cases, 9 deaths.

SMALLPOX

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15	22	29
Algeria: Algiers Department	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil:																		
Bahia (alastrim)	C	16	10	6	3	------	------	------	------	------	------	------	------	------	------	------	------	------
Porto Alegre (alastrim)	D	2	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Recife (alastrim)	C	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Santos	C	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------
British East Africa:																		
Kenya	C	116	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tanganyika	C	65	186	121	------	100	223	------	------	------	------	------	------	------	------	------	------	------
Canada:																		
Alberta	C	5	------	------	------	------	------	------	------	------	------	------	------	------	------	[1] 1	------	------
Quebec	C	------	------	------	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------	------
Saskatchewan	C	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------	------	[1] 1	------	------
China:																		
Canton [2]	C	------	------	------	------	------	------	------	------	------	------	1	1	------	------	------	------	------
Dairen	C	2	2	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------
Foochow	C	P	P	P	P	P	------	P	------	------	------	P	------	------	------	------	------	------
Hangchow	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hankow	C	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hong Kong	C	9	82	------	1	1	------	------	5	4	2	------	7	8	30	26	75	81
Shanghai	C	29	2	1	------	------	------	------	------	------	1	------	------	------	------	------	3	------
Tientsin	C	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------
Colombia (see also table below): **Barranquilla**	D	1	------	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------
Ecuador: **Guayaquil**	C	37	20	3	13	2	------	------	2	------	2	------	1	2	1	------	1	------
Egypt: **Port Said**	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Eritrea	C	2	------	28	52	9	7	------	------	------	------	------	------	------	------	------	------	------
France. (See table below.)																		
Great Britain: England and Wales—Chester County	C	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------
Greece: **Salonika**	C	24	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

[1] For 2 weeks.

[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 1938, 100 cases of smallpox were admitted to hospitals in Canton, China.

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

SMALLPOX—Continued

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15	22	29
Guatemala. (See table below.)																		
India	C	6,578	3,026	1,738	1,756	336	466	364	638	718	959	1,205	------	------	------	------	------	------
	D	1,875	910	461	429	70	99	68	171	147	224	297	------	------	------	------	------	------
Assam	C	107	98	58	45	5	10	5	17	12	16	20	8	21	13	13	19	29
Bombay Presidency	C	331	177	181	154	5	49	35	41	102	83	205	180	229	208	------	------	------
	D	106	53	38	33	3	17	9	12	27	28	51	59	57	60	------	------	------
Bombay	C	104	28	47	41	5	23	26	19	50	43	66	110	82	92	164	163	189
	D	69	18	23	23	3	8	9	10	19	23	23	54	47	49	86	81	87
Calcutta	C	14	40	28	20	5	5	5	9	3	15	20	31	43	46	46	52	48
	D	10	16	17	14	1	3	4	5	2	11	13	17	31	35	34	31	46
Central Provinces and Berar	C	153	61	44	26	4	------	1	2	1	------	8	6	2	9	11	22	7
Chittagong	C	2	------	------	------	------	------	------	------	------	------	------	------	------	1	------	2	------
Delhi	C	12	7	------	1	------	------	------	------	------	1	2	3	2	[3]4	------	1	2
Karachi	C	2	------	[3]2	------	[3]1	------	1	------	[3]1	------	------	3	3	[3]3	6	3	3
Madras Presidency	C	462	415	318	304	66	67	50	30	30	62	30	123	------	------	------	------	------
	D	104	95	62	51	7	3	12	4	6	15	5	25	------	------	------	------	------
Madras	C	95	102	76	74	14	13	9	14	10	10	19	49	58	50	64	107	80
Northwest Frontier Province	C	171	76	27	154	112	70	20	178	16	113	139	149	277	106	88	202	75
Orissa Province	C	462	310	117	193	40	81	35	50	63	94	69	127	102	147	93	287	------
Punjab	C	560	165	69	162	55	182	138	29	192	300	226	317	310	332	380	337	------
Rangoon	C	------	[3]1	------	3	------	------	4	1	------	1	------	5	7	9	17	------	14
Sind State	C	279	209	96	78	19	41	68	36	75	79	52	230	97	67	119	201	159
Indochina (French) (see also table below):																		
Saigon-Cholon	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tonkin Province	C	------	------	------	------	------	------	------	------	------	------	------	26	------	75	60	------	------
Haiphong	C	------	------	------	------	------	2	------	------	------	4	21	11	14	41	32	31	------
Hanoi	C	------	------	------	------	------	------	------	------	------	------	------	1	1	------	2	1	------
Iran	C	------	3	------	------	2	------	------	------	------	------	------	------	------	------	------	------	------
Teheran	C	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Iraq	C	------	5	------	------	------	------	------	------	------	------	------	------	5	------	6	------	------
Italian Somaliland	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

Mexico (see also table below):																		
Chihuahua	C	1		1														
Ciudad Juarez	D	1																
Durango	D	1			1													
Mazatlan	C	1																
Mexico, D. F	C	10	8	6	5	5	5	1		2								
Monterrey	C	1	1	2				1		1						1	1	2	1
San Luis Potosi	D				1													
Torreon	C	7	3	1							1		1		1		5	1
	D	11	7	3	5				4	1	2		4		2		1	1
Vera Cruz	C									1								
Morocco. (See table below.)																		
Nigeria	C	229	71	11	156		29				50							
Nyasaland	C	1	12		31	2	5	4				3						
Panama Canal Zone: Colon	C				2													
Portugal (see also table below):																		
Lisbon	C	6	1	5	3		1	1	1		1		1			4		
Oporto	C	1		2														
Senegal. (See table below.)																		
Siam	C	3	1											35		12		
Sierra Leone	C		5		10													
Southern Rhodesia	C				4		100	21		12		3	99					
Sudan (Anglo-Egyptian)	C	8	6	27	64	7	58	13	10	14	13	18	19	44	28	2	81	127
Unfederated Malay States: Kedah	C	P																
Venezuela: Puerto Cabello.[4]																		

On vessels:

S. S. *Empress of Japan* at Kobe from Manila ..... 1 case ..... Aug. 11, 1937
S. S. *Northern Prince* at New York from Rio de Janeiro .. 1 case ..... Aug. 19, 1937
S. S. *Empress of Asia* at Honolulu ..... 1 case ..... Sept. 5, 1937

On vessels—Continued.

S. S. *Castalia* at Suez from Karachi and Bombay ..... 1 case ..... Oct. 5, 1937
S. S. *Egra* at Rangoon from Calcutta ..... 1 case ..... Nov 16, 1937
S. S. *Tatsuta Maru* at Honolulu ..... 1 case ..... Feb. 4, 1938

[3] Imported.

[4] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello, Venezuela.

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

SMALLPOX—Continued

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

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
Angola	C		12	18			
Argentina	C				3	1	
Belgian Congo	C	360	312	391	352	166	
Bolivia: La Paz	C			30			
China: Manchuria—Harbin	C	1					
Colombia (see also table above)	C		[1] 209				
France	C					2	
Guatemala	C		1				
Indochina (French) (see also table above)	C	143	226	96	147	197	319
	D	30	63	12	28	43	91
Mexico (see also table above):							
Aguascalientes State	C			5			
Campeche State	C			1			
Chihuahua State	C			4		21	
Coahuila State	C			2		17	
Durango State	C			15		17	
Guanajuato State	C			7		38	
Hidalgo State	C			1			
Jalisco State	C			5			
Mexico—Continued.							
Mexico State	C			3		3	
Mexico, D. F	C	18	9	11	5	17	
Mexico City	D	3	1	2			
Michoacan State	C		4	37		59	
Nayarit State	C			1			
Nuevo Leon State	C			2		6	
Monterrey	C	1					
Queretaro State	C		1	5	1	2	
Sinaloa State	C			3			
Tabasco State	C			1		1	
Tlaxcala State	C			3		3	
Vera Cruz State	C			2	1	25	
Yucatan State	C	1				1	
Zacatecas State	C			1		7	
Morocco	C	4		1	1	2	
Portugal (see also table above)	C			61	53	52	
	D			8	4	4	
Senegal	C	16					

[1] For July and August.

TYPHUS FEVER

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended— October 1937					November 1937				December 1937				January 1938		
					2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
Algeria:																				
Algiers Department	C	197	30	7	------	20	2	------	16	18	------	[1] 27	44	------	6	------	7	------	------	------
Algiers	C	73	8	------	------	------	------	------	15	------	------	------	------	------	------	------	------	------	------	------
Constantine Department	C	203	83	26	2	9	2	------	34	1	------	[1] 14	8	29	37	------	15	21	------	[1] 26
Bone	C	15	4	------	------	------	------	------	1	------	------	------	------	------	1	------	------	------	------	------
Constantine	C	22	7	2	------	------	------	------	7	------	------	------	------	------	------	------	------	------	------	------
Philippeville	C	1	------	------	------	------	------	------	2	------	------	------	1	------	------	------	------	------	------	------
Oran Department	C	16	7	4	------	------	------	------	------	------	------	[1] 13	3	2	------	------	20	1	------	[1] 3
Southern Territories	C	4	1	------	------	------	------	------	------	------	------	------	2	------	1	------	------	------	------	------
Basutoland	C	------	9	6	------	------	------	[2] 3	------	------	------	------	------	------	------	------	------	------	------	------
British East Africa: Kenya	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1
Bulgaria	C	------	------	------	12	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Chile	C	273	------	176	57	66	71	61	50	59	50	75	102	------	------	------	------	------	------	------
Antofagasta Province	C	1	------	1	------	------	------	------	------	1	1	1	1	------	------	------	------	------	------	------
Concepcion Province	C	32	16	7	------	------	4	------	------	------	1	1	------	------	------	------	------	------	------	------
Iquique	C	------	------	------	------	------	------	------	------	1	------	------	------	------	------	1	------	------	------	------
Linares Province	C	9	6	5	2	------	------	------	------	------	1	1	10	------	------	------	------	------	------	------
Malleco Province	C	5	8	6	------	2	1	1	------	2	------	1	------	------	------	------	------	------	------	------
Nuble Province	C	7	3	14	1	17	2	1	3	9	5	------	5	------	------	------	------	------	------	------
Santiago Province	C	137	151	114	50	38	47	53	42	35	40	65	83	------	------	------	------	------	------	------
Valparaiso	C	50	47	14	5	4	5	1	1	------	1	2	2	1	------	------	------	------	1	2
China (see also table below):																				
Canton	C	------	------	------	------	------	------	1	2	------	------	------	------	------	------	------	------	------	------	------
Dairen	C	------	------	------	------	1	------	------	------	------	------	------	2	------	------	1	------	------	------	------
Hankow	C	1	1	------	------	------	------	------	2	------	------	------	------	------	------	------	------	------	------	------
Shanghai	C	5	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Swatow	C	3	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Tientsin	C	1	1	3	------	------	------	1	------	4	------	1	2	4	------	------	------	------	------	------
Tsingtao	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Chosen. (See table below.)																				
Egypt:																				
Alexandria	C	6	13	4	------	2	2	------	------	3	1	3	------	2	------	------	1	1	------	------
Asyut Province	C	6	2	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------
Beheira Province	C	23	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Beni-Suef Province	C	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------
Cairo	C	------	------	1	------	------	------	------	------	------	------	------	------	------	1	------	------	3	------	------
Dakahliya Province	C	31	3	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

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

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

TYPHUS FEVER—Continued

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended— October 1937					November 1937				December 1937				January 1938		
					2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
Egypt—Continued.																				
Faiyum Province	C	1																		
Gharbiya Province	C	41																		
Girga Province	C	2																		
Giza Province	C	2																		
Minufiya Province	C	4																		
Minya Province	C		1																	
Port Said	C	2																		
Sharkiya Province	C	1																		
Suez	C	2		2																
Provinces	C	130		10	1	1	1			2	4		1	1		4	2	6	11	12
Eritrea: Asmara	C	1									2									
Germany: Frankfort-on-Main	C				1															
Great Britain—England and Wales—Gloucester County	C											1								
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	4	1	2	2		2					1				1		1	1	
Hungary	C	1																		
Iran	C			1												4				
Iraq:																				
Baghdad	C	2																		
Kirkuk Province	C	2																		
Latvia. (See table below.)																				
Libya. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C												2							
Mexico, D. F	C	2	27	22	3	5	2	3	4	4	3	7	4	13	3	3	1			12
Torreon	C										1									
Morocco (see also table below)	C	85	21	16	1	17	11	7	2	1		6	22	18	58	102	137	198	80	
Casablanca	C	5	5			4										4	20		16	6
Netherlands: Rotterdam	C															[3] 1				

Nigeria	C				2															
Palestine:																				
Haifa	C	3	4	11	3		7		6	3		2		3	3	2		2		
Jaffa	C	3	9	9	1		6	5	1	2	5	4	6			2	1			3
Panama Canal Zone. (See table below.)																				
Poland	C	89	43	26	9	9	9	19	7	12	10	23	23	37	40	35	29	54	98	
	D	1	4					1		2	1		2		1	1	1	1	6	
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C													1						
Straits Settlements: Singapore	C			1					1											
Switzerland	C	1				1														
Trans-Jordan	C	1									1									
Tunisia:																				
Tunis	C	4	10	7			2	1				3		1			1	2		
Provinces	C	337	216	76	1	38	24	40	29	23	29	63	46	11	34		12	12	26	
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C									1										

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
China: Manchuria—Harbin	C	14	8	2			
Chosen	C				19		
Greece	C	5	3	6	18		
Guatemala	C	16	10	6	2		
Latvia	C			1			
Libya	C	10					
Lithuania	C	7		2	6	7	
Mexico (see also table above):							
Aguascalientes State	C			1		1	
Campeche State	C			2			
Durango State	C			1		8	
Guanajuato State	C	3		19		22	
Hidalgo State	C		3	4	2	19	
Jalisco State	C	1		2		2	
Mexico State	C	14	38	29	19	42	
Mexico D. F	C	16	27	29	14	20	
Mexico City	D	5	3	4			
Michoacan State	C			5		11	
Puebla State	C			55		9	

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
Mexico—Continued.							
Queretaro State	C		2	3	2	2	
San Luis Potosi State	C			6	4		
Tamaulipas State	C			2			
Tlaxcala State	C			3			
Vera Cruz State	C			9			
Zacatecas State	C			2		6	
Morocco (see also table above)	C	88	25	16	39	47	914
Panama Canal Zone	C		1	1			
Portugal	C		2	1	26	28	
Rumania	C	61	26	31	33	68	
Turkey	C	30	23	27	100		
Istanbul	C	2	2	4		4	2
Union of South Africa:							
Cape Province	C	50	81		162	75	
Natal	C		2			9	
Orange Free State	C	11	2		3	3	
Transvaal	C	13			5	1	

[3] Suspected.

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

YELLOW FEVER

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

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended— October 1937 2	9	16	23	30	November 1937 6	13	20	27	December 1937 4	11	18	25	January 1938 1	8	15
Belgian Congo: Zongo.[1]																				
Brazil:																				
Amazonas State	D		1																	
Matto Grosso State [2]	D	1																		
Minas Geraes State	D																		1	2
Para State [2]	D	6	1	1																
Santa Catharina State	D													1						
Sao Paulo State.[3]																				
Colombia:																				
Boyaca Department	C	2	1																	
	D	4	2				1									1				
Caldas Department	D			1																
Cundinamarca Department	D	1	2	2																
Intendencia of Meta—Villavicencio	D			1																
Santander Department	C			2																
	D	1	4	6	1				2						1		2			
Dahomey: Cotonou	C															[4] 5				
French Equatorial Africa:																				
Bangui	D			1																
Fort Archambault	C			[4] 2																
Libreville	C	1																		
	D	1																		
Gambia: Georgetown	C																			
Gold Coast	C	23	9	3	1	1		1	1	[5] 7			[4] 1			2		[5] 5	[4] 4	[4] 1
	D	19	4	2	1					2			[4] 1			2				
Accra	C	2	1	[4] 1																
Keta	C																	1		
Ivory Coast:																				
Abidjan.[6]																				
Agboville	C		1																	
Anyama	C																		1	
Gaoua	C			[5] 3										[4] 1						
	D			1																
Touba	C			[4] 1		[4] 1														

Nigeria	C	7	5	2	------	2	1	[4]1	[4]1	------	------	------	2	------	------	------	[4]1	1	------	1
	D	[3]	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	1
Paraguay	C	P	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Asuncion	C	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------
Senegal	C	------	2	2	1	4	4	------	3	[1]8	2	------	2	1	------	1	1	------	------	------
	D	------	1	------	------	------	------	------	------	1	------	------	1	------	------	------	------	------	------	------
Dakar	C	------	------	------	------	[5]1	------	------	------	[5]2	------	------	------	------	------	------	------	------	------	------
Rufisque	C	------	------	------	1	------	1	------	------	------	2	------	------	------	------	------	------	------	------	------
Thies	C	------	------	------	------	------	2	------	2	------	------	------	1	------	------	------	------	------	------	------
Sudan (French)	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	------	------
San	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	1	------	------
Toukoto	C	------	------	------	------	------	------	------	------	------	[4]1	------	------	------	------	------	------	------	------	------

[1] A report dated Feb. 11, 1938, states that yellow fever is present in Zongo, Belgian Congo.
[2] See also reports of yellow fever in Brazil on pp. 463, 536, 657, 683, 762, 818, 912, 1134, 1248, 1327, 1471, 1637, and 1691 of the PUBLIC HEALTH REPORTS for 1937.
[3] A report dated Feb. 8, 1938, stated that the presence of yellow fever has been confirmed in Sao Paulo State, Brazil.
[4] Suspected.
[5] Includes 1 suspected case.
[6] During the week ended Feb. 5, 1938, 1 case of yellow fever was reported in Abidjan, Ivory Coast.
[7] Includes 3 suspected cases.
[8] Imported.