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ATTEMPTS TO PRODUCE TUMORS IN RATS BY FEEDING CRUDE WHEAT GERM OIL MADE BY PROLONGED ETHER EXTRACTION [1]

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In 1937 Rowntree, Lansbury, and Steinberg (*8*) reported the occurrence of malignant intra-abdominal tumors in albino rats that were fed a crude wheat germ oil prepared by ether extraction. This interesting observation was confirmed in a simultaneous publication by Dorrance and Ciccone (*4*), who repeated the work with the use of materials from Rowntree's laboratory at the Philadelphia Institute for Medical Research. Rowntree and his collaborators (*10*) were able to produce these tumors, usually transplantable spindle-cell sarcomas, in more than 90 percent of the animals fed. Rats of the Wistar, Buffalo, and Yale albino strains were used. When daily doses of 1 cc. were administered, either poured over the diet or given directly by dropper, tumors were palpable in from 36 to 268 days. When larger doses were used, as approximately 21 percent of a diet mixture or as daily supplements of 3.5 to 4 cc., tumors were produced in as little as 13 days and in an average of about 54 days. The active fraction was apparently in that portion of the oil which settled out when kept in the refrigerator. Negative results were secured with refined wheat germ oil from ether extraction, expressed oil, naphtha extracted oil, and vitamin E concentrate.

After further investigation, Rowntree, Steinberg, and Brown (*9*) reported that the primary site of tumor origin seemed to be chiefly the intestinal wall in the 109 tumor-bearing animals which they had observed. Also, the crude oil was found to be effective by intraperitoneal injection. It was mentioned that a few sarcomatous tumors were obtained with two other cereal germ oils that were prepared and fed in the same manner as the wheat germ oil.

Several publications have recently appeared in which the above type of results could not be secured with wheat germ oil made by ether extraction. Carruthers (*1*), using the method of wheat germ

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oil preparation originally described by Rowntree and coworkers (*10*), fed the oil to 12 Wistar and Sprague Dawley rats as a supplement to the Rowntree stock diet. After 258 days, during most of which time a 1-cc. dosage was used, no tumors were observed. Halter (*6*) fed 12 Wistar rats 1-cc. doses of an ether-extracted wheat germ oil for 12 months, but the results were negative. Evans and Emerson (*5*), using Long-Evans rats and an experimental diet, fed an ether-extracted oil as 30 percent of the diet to 8 rats, but no neoplasms were found after 370 days. Dingemanse and van Eck (*3*) fed 10 Piebald-Wistar animals an ether-extracted oil in 3- to 4-cc. daily doses as a supplement to the ground Rowntree diet. After 267 days no tumors could be found. Working along a somewhat different line, Day, Becker, and McCollum (*2*) investigated the possible role of ether peroxides by dissolving cold pressed wheat germ oil in ether and then aerating so as to double the peroxide content of the oil. Both the treated and untreated oils failed to produce tumors, as determined by feeding 1- to 2-cc. daily supplements for 170 days to piebald rats of the McCollum strain.

The negative character of these publications contrasts with the results of Rowntree and his collaborators. However, it should be noted that the experiments probably did not entirely conform to the latest recommendations of Rowntree (*7*) with respect to strain of rats, stock diet, and preparation of oil. It is regarded as highly advisable to use not quite full-grown rats of a strain of known susceptibility, to adhere to the Rowntree stock diet, and to prepare the oil by a thorough (24 hours or longer) ether extraction of the wheat germ to secure a sufficiently potent product. It is questionable whether all these conditions were satisfied in the negative researches mentioned.

The suggestion or evidence of neoplasm formation associated with the ingestion of an oil derived from the embryo of one of our principal cereal grains is deserving of attention and careful consideration. In the following report is described a series of experiments, begun in the early part of 1938, in which attempts were made to test variable factors and to duplicate the Rowntree experimental conditions as nearly as possible.

EXPERIMENTAL

Experiment 1.—Feeding oil-diet mixture to piebald rats: In this preliminary experiment the animals used were McCollum strain piebald rats, the nutritional behavior of which is well known. The oil was prepared in this laboratory according to the early method described by Rowntree and coworkers (*10*). Although clear when concentrated after filtration of the ether extract, the oil showed a slight sediment after being kept in the refrigerator at about 8° C. A diet mixture was prepared by adding the oil to the McCollum stock diet

in the ratio of 3 liters to 10 kg. of solid food, or approximately 21 percent by weight. The McCollum stock diet is a ground mixture of the following composition: Wheat, 20 parts; maize, 20; rolled oats, 20; flaxseed oil meal, 10; casein (crude), 3.5; whole milk powder, 25; calcium carbonate, 0.5; sodium chloride, 1; ferric citrate, 0.0011; and copper sulfate ($CuSO_4.5H_2O$), 0.0004. A supplement of greens is given twice a week.

At the age of 21 days a group of 10 rats, weighing from 32 to 37 grams and evenly divided as to sex, was started on the oil diet. After 105 days, during which the animals showed fairly good growth, the experiment was terminated. Autopsy of the animals revealed no sign of tumors (see table 1), although Rowntree obtained tumors in 19 to 63 days, or an average of 38 days, with this concentration of oil under his experimental conditions.

Experiment 2.—Feeding oil-diet mixture to albino rats: As a result of the failure to obtain tumors in the preliminary effort, a new series of experiments was designed to extend the work with the benefit of the later conditions which had by then been set forth by Rowntree (7). Two kinds of albino rats were used, the laboratory P. H. strain and the Buffalo strain. The latter were secured from the National Institute of Health, United States Public Health Service,[2] which was the source of Rowntree's Buffalo rats.

The basal diet was an exact copy of the Rowntree stock diet, which is made up of the following: Cracked corn, 60 parts; rolled oats, 15; meat scraps, 14; skimmed milk powder, 10; and sodium chloride, 1. To this mixture was added 1.5 percent of cod-liver oil (Pratt's). Once a week a supplement of carrots (without tops) was given, each rat receiving about one-third of a medium-sized carrot. This diet is somewhat unusual; it is not ground and consequently contains fairly large corn particles, some measuring about $3 \times 4 \times 4$ mm.

The wheat germ oil was prepared by a 24-hour continuous flow extraction of the fresh germ (from Russell-Miller Milling Co.) with U. S. P. ether (Mallinkrodt's or Merck's) (7). Before use the ether was usually kept over a saturated aqueous solution of sodium hydroxide (7). It should be noted particularly that, whereas the extracting ether ran quite colorless after about 6 hours, indicating the complete removal of the usual oil, the extraction was continued to the end of the 24 hours, that is, more than three times the period required for the extract to run colorless. The additional extraction of 18 hours was accompanied by some increase in the turbidity of the oil extract. The unfiltered extract was concentrated to small volume by distillation on a water bath. Residual ether was then driven off by heating 1 to 2 hours under vacuum on a water bath and finally on a steam bath. The oil was kept in the dark at room temperature (7), the

[2] Obtained through the kindness of Dr. J. W. Thompson, National Cancer Institute, Bethesda, Md.

sediment amounting to about one-fourth the volume after two weeks of settling. Before the oil was used, the sediment was always redispersed by shaking.

A diet mixture was prepared containing approximately 21 percent oil. This was fed to a group of 12 Buffalo rats and 6 P. H. rats, evenly divided as to sex. When started on the experimental diet the animals were 95 to 115 days old, the Buffalo rats weighing 100 to 195 grams and P. H. rats 135 to 205 grams. The Buffalo rats were maintained for 186 days and the P. H. rats for 125 to 145 days. At the end of these periods no neoplasms were found at autopsy. (See table 1.)

TABLE 1.—*Experiments on feeding rats wheat germ oil prepared by ether extraction. No tumors found*

Experiment number	Strain	Number of rats	Starting age (days)	Starting weight (gm.)	Basal diet	Oil dosage	Days on oil
1	McCollum	10	21	32-37	McCollum	21 percent	105
2	Buffalo	12	95-115	100-195	Rowntree copy	21 percent	186
	P. H.	6	100	135-205	do	21 percent	125-145
3	Buffalo	6	95-115	125-185	do	3-5 cc. per day	246-440
	P. H.	6	100	137-200	do	3-5 cc. per day	125-243
4	Buffalo	10	86-146	140-190	Rowntree lab	3-5 cc. per day	192-224
5	Wistar	5	90-167	143-177	do	4 cc. per day	[1] 190-230

[1] One animal died at 118 days.

Experiment 3.—Feeding oil supplements to albino rats: In this experiment the 24-hour extracted oil was poured over the copy of the Rowntree diet as a daily supplement of 4 cc. per rat. Six Buffalo rats, 95 to 115 days of age and 125 to 185 grams in weight, and six P. H. rats, 100 days of age and 137 to 200 grams in weight, were kept in individual cages and given the oil supplement. The animals of each group were evenly divided as to sex. After about 100 days, during which the males gained weight slightly and the females lost, the dosage of oil was raised to 5 cc. for the larger males and lowered to 3 cc. for the females. These dosages allowed the animals to survive, although with slowly decreasing weights in most cases. The Buffalo rats died or were sacrificed in 246 to 440 days and the P. H. rats in 125 to 243 days. No tumors were found. (See table 1.) By comparison, with a dosage of 3.5 or 4 cc., Rowntree reported tumors in his Buffalo rats in 13 to 99 days (*10*).

It is interesting that, in the one P. H. rat and all six Buffalo rats which survived 243 days or more, hobnail livers were found. Microscopic examination confirmed the finding as diffuse nodular (Laënnec's) cirrhosis, together with fatty infiltration. Observations on this point are being continued.

Experiment 4.—Feeding oil supplements with Philadelphia Institute diet: The stock diet for this experiment, with the exception of the carrots, was kindly furnished by Dr. Rowntree from his own laboratory supply at the Philadelphia Institute for Medical Research. The animals used were 10 Buffalo rats, 3 male and 7 female, the parents of which had been kept on the Rowntree diet since long before mating. The wheat germ oil was the same as in experiment 2, that is, a preparation made by 24 hours of ether extraction.

When the rats were 86 to 146 days old, weighing 140 to 190 grams, they were given daily oil supplements of 5 cc. for the males and 4 cc. for the females. During the latter part of the experiment the dosage sometimes had to be reduced slightly to keep the animals alive. The members of this group, after 192 to 224 days of the oil supplement, showed no tumors. (See table 1.) As has been previously mentioned, Rowntree's Buffalo rats were found to have tumors in 13 to 99 days with an oil dosage of 3.5 or 4 cc. per day.

Experiment 5.—Feeding oil supplements and Philadelphia Institute diet to Philadelphia Institute animals: Through the kindness of Dr. Rowntree a group of five half-grown Wistar rats, born and raised in his own colony, was obtained. These animals, of which three were males and two females, were about 50 days old when received. They were maintained on the diet secured from Rowntree's laboratory until they were 90 to 167 days old, at which times they weighed 143 to 177 grams. Wheat germ oil, prepared by 24-hour extraction, was then poured over the diet as a supplement of 4 cc. per rat per day.

One animal died after 118 days but showed no sign of a tumor. The other animals were maintained for 190 to 230 days on the oil without the appearance of tumors. (See table 1.) Under these conditions Rowntree and coworkers produced tumors in their Wistar rats in 15 to 111 days, or in an average of 54 days (*10*).

DISCUSSION

The report by Rowntree and coworkers of tumor production by feeding a special wheat germ oil has created great interest. Indeed, preparations of oil from wheat germ are used somewhat for therapeutic purposes, but these refined products were stated to be free from tumor-producing action (*10*).

However, failures to confirm the work have left the subject in an uncertain position. In the experiments described in this report no intra-abdominal or other tumors occurred, despite the use of the same strains of rats (Buffalo and Wistar) and the same stock diet. Unfortunately, a sample of the oil from Rowntree's laboratory could not be made available, but the wheat germ oil used was prepared by 24 hours of ether extraction, following the latest directions of Rowntree and coworkers. Some animals were born, raised, and maintained on

diet secured directly from the Rowntree laboratory, and a group of animals was also obtained from the same place. In all cases the experiments were continued well beyond the reported maximum induction period for the dosages used.

In view of these consistently negative results it seems conceivable that some additional factor may be necessary besides a susceptible strain of rats, the particular stock diet, and the specially prepared oil. The induction period sometimes found, such as 13 to 54 days, is in general much shorter than that required by the most potent hydrocarbon carcinogens when injected directly into rats. Furthermore, the induction period shows considerable variation with the same oil dosage, such as from 15 to 111 days with 4-cc. amounts, or 36 to 268 days with 1-cc. amounts. Further investigations are necessary in order to elucidate this problem.

SUMMARY

1. A crude wheat germ oil, prepared by 24 hours of continuous-flow ether extraction, was fed to 18 Buffalo and 12 P. H. strain rats as 21 percent of the diet or as daily supplements of 3 to 5 cc. per rat. The oil administration was maintained for 125 to 440 days, but no tumors were found.

2. A group of 10 Buffalo rats, born and maintained on stock diet from the Philadelphia Institute, received the oil in 3- to 5-cc. daily doses for 192 to 224 days without the appearance of tumors.

3. A group of five Wistar rats, born and raised in the Philadelphia Institute colony, was fed the oil as 4-cc. daily supplements to stock diet secured from the same Institute. The feeding was continued for 190 to 230 days, with the results again negative.

ACKNOWLEDGMENT

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FACTORS INFLUENCING CARCINOGENESIS WITH METHYLCHOLANTHRENE

III. THE EFFECT OF SOLVENTS

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Few of the data on the more exact details concerning the carcinogenic properties of even the more common cancer-provoking substances, as recorded in numerous papers from different institutions, are directly comparable. The variability in the species and strain of the experimental animals, in the method of administration, the solvents or other media and the purity of the hydrocarbons, and in the criteria for recording the results contributes to the discrepancies. The desirability of more uniform procedures is well brought out in Fieser's (*1*) attempt to correlate the results obtained throughout the world during the preceding 8 years.

One of the factors which modifies the incidence and the latent period of carcinogenesis with the carcinogenic aromatic polynuclear hydrocarbons is the physical state in which the compounds are administered to the animals. With 1:2:5:6-dibenzanthracene, tumor formation is slower when the chemical is injected as a dispersion in horse serum or adsorbed on charcoal than when it is dissolved in lard (*2*). The dissolved state appears to be the most efficacious in eliciting subcutaneous tumors; it is possible that some constituent in the solvent increases tissue permeability or by some other action renders the compound more active physiologically.

Various solvents for the hydrocarbons have been used, including lard (*2*), sesame oil (*3*), paraffin (*4*), and arachis oil (*5*). Lard is perhaps the most extensively used agent because it is cheap, readily available, and convenient to handle. Data that have been accumulating in this laboratory, however, suggest that the results obtained with lard as a solvent are significantly variable (*6*). Like other animal and plant oils, it is a "complex mixture of variable composition which may undergo changes on storage or on being heated" (*1*).

Since the role of the various factors modifying carcinogenesis with hydrocarbons must be ascertained before quantitative studies can be undertaken, the following investigations on the effect of lard and other solvents upon sarcogenesis with 20-methylcholanthrene were begun in September 1938.

EXPERIMENTAL

The animals used in these experiments were male mice of strain C_3H, raised in this laboratory, and strain A and Y males obtained from the Roscoe B. Jackson Memorial Laboratory. All were kept under identical environmental and dietetic conditions; all were from 2 to 3 months of age at the time of injection, since it has been found that the age of the animals modifies the time of appearance of tumors induced with methylcholanthrene (*7*). The C_3H strain of mice was selected for the majority of experiments because it is very susceptible to the production of sarcoma with carcinogenic hydrocarbons; strain A mice are most susceptible to spontaneous and induced primary lung tumors, and strain Y animals are fairly resistant to the development of both types of tumor (*8*).

The carcinogenic agent employed was synthetic and purified 20-methylcholanthrene, with a melting point of 179.8–180.4° C. (corr.); the same sample was used in all experiments. The concentration of the hydrocarbon in all solvents, unless specifically noted as otherwise, was 0.2 percent, so that 0.25 cc. contained 0.5 mg. of methylcholanthrene.

The solutions, heated to about 40° C., were administered to the animals by a single subcutaneous injection into the right axilla. The mice were examined weekly. As soon as a hard mass which could not be dissipated by pressure was present, the animal was marked and permitted to live until an indubitably growing tumor was observed when it was killed and autopsied. The tumors were recorded weekly, according to the earliest time a hard mass was palpable; the results are presented in 2-week periods in order to conserve space.

The averages of latent periods were computed by multiplying the number of tumors appearing each week by the time in weeks after injection, and dividing the sum by the total number of tumors. Mice dying of causes other than tumor before tumors began to appear in the particular series were subtracted from the original total of the animals injected. In most instances, the mice which are recorded as not having developed tumors were alive and well many weeks after the last sarcoma had appeared in the group.

Experiment 1. Lard as solvent.—Four samples of lard were used as solvents for methylcholanthrene: (1) Lot A, best grade lard obtained commercially, (2) lot B, lard obtained from the same source at another time, (3) lot C, best grade lard bought from another dealer, and (4) lot D, tub lard which was slightly rancid.

The lards were filtered at 37° C., and the filtered portions stored at 4° C. for a few days. They were heated again after the addition of methylcholanthrene, sufficiently to effect solution, and injected into C_3H male mice when cooled to 40° C.

TABLE 1.—*Induction of subcutaneous tumors in C_3H male mice with 0.5 mg. of methylcholanthrene dissolved in 0.25 cc. of lard*

Time in weeks		8	10	12	14	16	18	20	22	24	26	28	30	32	Total number of tumors	Average latent time, in weeks	Standard deviation, in weeks	Standard error of average, in weeks
Lard sample	Number of mice injected	Number of tumors																
A	38	2	5	6	5	3	5	2	3	1	---	2	---	1	35	15.5	5.72	±0.96
B1	57	8	26	9	6	3	2	1	---	---	---	---	---	---	55	10.8	2.17	±0.29
B2	19	4	6	5	3	---	---	1	---	---	---	---	---	---	19	10.9	3.04	±0.72
C	23	---	3	3	4	5	3	2	---	1	1	---	---	---	22	14.9	4.24	±0.90
D	25	---	1	4	9	5	5	---	---	---	---	1	---	---	25	14.9	3.18	±0.64

The data are given in table 1. The results with lard lot B have been reported previously (*6*) and include two groups, designated as B1 and B2. The average latent period with lard lots A, C, and D are in close agreement. The observed difference between lard lots B and A, of 4.7 weeks, is 3.6 times the standard error, and the observed difference between lard lots B and C or D, of 4.1 weeks, is 3.8 times the standard error. The differences, therefore, are statistically significant (*9*).

The four groups can be divided into the "rapid" and "slow" lots. Figure 1 shows that when the results with lard lot B, and the combined results with lard lots A, C, and D are plotted separately, two

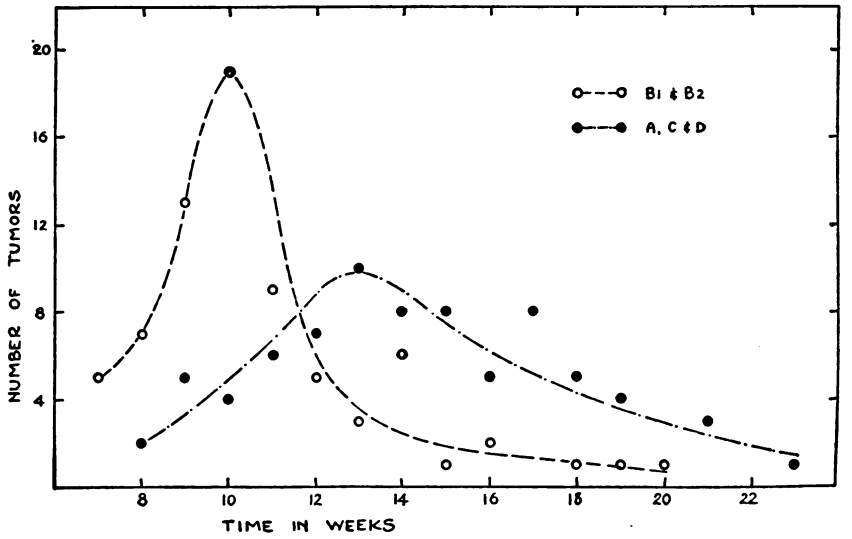

FIGURE 1.—Induction of subcutaneous tumors in C_3H male mice with 0.5 mg. of methylcholanthrene in 0.25 cc. of 4 lots of lard (experiment 1).

fairly regular but different curves are obtained. The slightly rancid lard D gave the same results as the best grade lards A and C.

Experiment 2. Glycerides and esters as solvents.—In an attempt to find a more desirable medium than lard for experiments with carcinogenic hydrocarbons, the following glycerides and esters [1] were used as solvents for methylcholanthrene: (1) Tricaprylin, M. P. 8.3° C., corr., (2) a mixture of equal parts of tricaprylin and trilaurin, M. P. 46.4° C., corr., (3) tricaproin, M. P. −25° C., corr., (4) butyl stearate, and (5) butyl phthalate.

Each C_3H male mouse received 0.5 mg. of the hydrocarbon in 0.25 cc. of the solvent. Another sample of tricaprylin, obtained from another source, and identified as tricaprylin "B," was slightly yellow in color and had a melting point of 8.6°–8.8° C., corr. In this instance, the concentration was 0.5 mg. of methylcholanthrene in 0.2 cc. of the glyceride.

The data are presented in table 2. The influence of the solvent upon carcinogenesis with methylcholanthrene is well illustrated. With tricaprylin tumors arose quickly and regularly within 6 to 14 weeks, an average of 9 weeks; the results were highly reproducible. The latent period was spread to a greater extent with tricaproin and butyl stearate. With butyl phthalate, the average latent period was over twice as long as with tricaprylin, and only 70 percent of the animals developed tumors.

TABLE 2.—*Induction of subcutaneous tumors in C_3H male mice with 0.5 mg. of methylcholanthrene dissolved in various esters*

Time in weeks			6	8	10	12	14	16	18	20	22	24	26	28	Total number of tumors	Average latent time, in weeks
Solvent	Volume	Number of mice injected	Number of tumors													
	cc.															
Tricaprylin	0.25	19	1	8	9	1	---	---	---	---	---	---	---	---	19	8.5
Tricaprylin "B"	.2	20	1	6	6	6	1	---	---	---	---	---	---	---	20	9.5
Tricaprylin-trilaurin	.25	20	---	7	9	1	1	1	1	---	---	---	---	---	20	9.7
Butyl stearate	.25	25	---	6	7	6	3	1	---	---	1	---	---	---	24	10.7
Tricaproin	.25	20	---	2	6	3	2	2	2	1	1	---	---	---	19	12.4
Butyl phthalate	.25	16	---	---	1	---	---	1	1	1	1	3	2	1	11	21.3

None of the solvents used produced abscesses or ulcerations at the site of injection. The solvents were visible in the subcutaneous tissue for at least 12 weeks after injection, and no marked irritative reaction was discernible grossly. Except for butyl phthalate, the solvents were not toxic to mice in 0.5 cc. doses, and none of the control animals (5 to 8 for each compound) receiving the ester alone has developed tumors in 10 to 15 months after injection. Butyl

[1] The use of these compounds was suggested by Professor Louis F. Fieser (*1*), to whom we are also indebted for furnishing the chemicals.

phthalate was slightly toxic to mice, killing 2 out of 18 animals injected.

Experiment 3. Extracts of mouse tissue as solvents.—Interest in the influence of mouse-tissue extracts as solvents for carcinogenic hydrocarbons was stimulated by the report of Peacock and Beck (*10*) that such extracts [2] inhibited the formation of sarcoma with 3:4-benzpyrene. Morton and Mider (*11*) substantiated the finding; with 0.25 mg. of benzpyrene in 0.25 cc. of sesame oil, 36 tumors occurred in 46 C57 black strain mice, whereas with the same concentration of the hydrocarbon in a petroleum-ether extract of mouse carcasses, 1 tumor appeared in 44 animals.

These observations were apparently at variance with the data at this laboratory. As shown in table 3, the latent periods of carcinogenesis with methylcholanthrene or 1:2:5:6-dibenzanthracene were slightly longer, and the incidence of tumors with the latter hydrocarbon was slightly lower when the compounds were dissolved in ethyl ether extracts of mouse fat than when lard was used as a solvent. The differences, however, were not beyond the variability observed with various lots of lard (experiment 1).

TABLE 3.—*Induction of subcutaneous tumors in mice with 0.25 cc. of mouse fat or lard as solvent for carcinogen*

Time in weeks					8	10	12	14	16	18	20	22	24	Total number of tumors	Average latent time, in weeks
Solvent	Hydrocarbon	Dose in mg.	Strain of mouse	Number injected	Number of tumors										
A strain mouse fat	Dibenzanthracene	0.8	C3H	43	---	1	---	---	8	5	12	4	2	32	18.5
Lard	Dibenzanthracene	0.8	C3H	15	---	---	2	---	3	---	7	---	3	15	17.8
A strain mouse fat	Methylcholanthrene	0.8	C3H	20	5	6	7	1	1	---	---	---	---	20	10.2
Lard	Methylcholanthrene	0.8	C3H	30	15	12	3	---	---	---	---	---	---	30	8.7
Y strain mouse fat	Methylcholanthrene	1.0	Y	10	---	---	---	---	1	3	2	2	---	8	18.8
Lard	Methylcholanthrene	1.0	Y	9	---	---	---	---	1	2	2	---	---	5	18.0

Oberling and his coworkers (*12*) observed no inhibition of tumor formation in rats injected with 3:4-benzpyrene in fat from the same animal, but the technique of extraction of the material is not described.

The problem was reundertaken when it was determined that Peacock's method of extracting the tissues differed from ours. Peacock (*13*) refluxed the dissected mouse fat or eviscerated mouse carcasses in a Sohxlet apparatus, and drove off the ether *in vacuo*. The technique used here was to shake the tissues in cold ethyl ether, and to drive the ether off the filtrate by heating at 37° C.

The possible roles of drying the tissues before extraction, and of extracting the tissues in cold ether (by shaking) as contrasted with hot ether (by refluxing) were therefore investigated. The fat from C3H mice, dissected from the subcutaneous, omental, and perirenal

[2] Obtained by Sohxlet extraction with ether of dissected mouse fat; the type of ether is not specified.

sites, was divided into two portions, one of which was dried *in vacuo* over phosphorus pentoxide. The two portions were again divided; one dried and one wet fraction were extracted by shaking in cold ethyl ether and the other two fractions by refluxing in a Sohxlet apparatus.

At the same time, fat was obtained from strain A mice and from the F_1 generation of I×C57 black mice, to ascertain whether strain difference would influence the results. These materials were prepared by cold ether extraction of the wet tissues. The effect of various organ extracts, of the liver, brain, abdominal contents including the intestines but excluding the liver, and the chest organs, extracted after drying in a Sohxlet, were also investigated. Extracts of whole mouse carcasses, including the skin and the intestinal tract, were made by shaking the wet tissue in cold ether or by refluxing the dried tissues in a Sohxlet apparatus.

Methylcholanthrene was dissolved in the extracts, 0.5 mg. per 0.25 cc., and the solutions injected into C_3H male mice. The small quantity of liver and brain extracts made necessary the addition of equal portions of mouse fat. As shown in table 4, 6 out of 9 animals injected with the hydrocarbon in fat from strain A mice developed sarcoma, and with the extract of the abdominal organs only 4 tumors were elicited in 12 mice, suggesting that these two solvents inhibited the carcinogenesis. The number of mice employed, however, is insufficient to attach particular significance to the findings; the important fact is that tumors were induced with all the fractions. The differences in results with the extracts are practically within the range of variation observed with different lots of lard.

TABLE 4.—*Induction of subcutaneous tumors in C_3H male mice with 0.5 mg. of methylcholanthrene in 0.25 cc. of various mouse tissue extracts*

Time in weeks				8	10	12	14	16	18	20	22	24	26	28	30	32+		
Tissue	Extraction		Number of animals	Number of tumors													Total number of tumors	Average latent time, in weeks
	Previous drying	Ether																
C_3H fat	−	Cold	20	6	6	2	2	1	1	--	1	--	--	--	--	--	19	10.9
Do	+	do	20	1	6	8	3	2	--	--	--	--	--	--	--	--	20	11.4
Do	−	Warm	10	--	5	3	2	--	--	--	--	--	--	--	--	--	10	11.2
Do	+	do	25	--	5	8	1	2	1	2	1	--	1	--	--	2	23	15.4
A fat	−	Cold	9	2	3	1	--	--	--	--	--	--	--	--	--	--	6	9.0
F_1 fat	−	do	10	1	2	2	1	--	--	2	1	--	1	--	--	--	10	14.9
Whole mouse, C_3H	−	do	12	3	5	4	--	--	--	--	--	--	--	--	--	--	12	9.5
Do	+	Warm	20	1	--	3	3	1	2	1	2	--	1	--	1	--	15	16.7
Abdominal contents, C_3H	+	do	12	--	--	1	1	1	--	--	--	--	--	--	--	1	4	17.9
Liver + fat, C_3H	+	do	20	5	5	6	1	2	--	--	1	--	--	--	--	--	20	11.0
Chest contents C_3H	+	do	9	4	3	1	1	--	--	--	--	--	--	--	--	--	9	10.5
Brain + fat, C_3H	+	do	10	6	4	--	--	--	--	--	--	--	--	--	--	--	10	8.4
Rest of body, C_3H	+	do	10	4	4	1	1	--	--	--	--	--	--	--	--	--	10	9.4

In former studies on the inhibition of tumor formation with animal fat fractions as solvents (*10, 11*), 3:4-benzpyrene was used as the carcinogen. It is more likely, however, that the difference in results is due to the fact that the petroleum-ether used by Morton and Mider (*14*) extracted a different fraction than the ethyl ether employed here.

Experiment 4. Effect of solvents in strain A mice.—Concurrently with the experiments described above, in which C_3H mice were used, small groups of strain A mice were also injected with methylcholanthrene dissolved in various solvents, 0.5 mg. per 0.25 cc. For clarity, they are recorded separately as one experiment.

TABLE 5.—*Induction of subcutaneous tumors in A strain male mice with 0.5 mg. of methylcholanthrene in 0.25 cc. of various solvents*

Time in weeks		8	10	12	14	16	18	20	22	24	26	28	30	Total number of tumors	Average latent time in weeks
Solvent	Number of mice injected	Number of tumors													
Lard (lot B)	18	1	2	4	2	2	1	2	---	1	---	---	---	15	13.2
Tricaprylin	9	1	3	3	---	---	---	---	---	---	---	---	1	8	12.5
Tricaprylin-trilaurin	9	2	3	2	---	---	---	---	---	---	---	---	---	7	9.8
Tricaproin	9	1	---	1	1	1	1	---	---	---	1	---	---	6	15.1
Mouse fat, A strain	20	1	2	2	2	1	1	2	1	---	1	---	---	13	14.7

The observations reported for the C_3H mice are reiterated in table 5 for the strain A animals. Since strain A mice are more resistant to the induction of subcutaneous sarcoma with carcinogenic hydrocarbons (*8*), tumors appeared later and in a lower percentage of mice than in the C_3H animals. Tricaprylin and the tricaprylin-trilaurin mixture were found to accelerate the formation of tumors, and mouse fats retarded their appearance slightly, as compared with the induction of sarcomas with methylcholanthrene dissolved in lard lot B.

Ulceration at the site of injection, for which the strain A mice are noted, was not reduced by the use of the glycerides instead of lard as a solvent for methylcholanthrene; with both, ulceration occurred in 20 to 30 percent of the animals. Tumor formation was neither retarded nor accelerated by the phenomenon.

The induction of primary pulmonary tumors in this group has been recorded elsewhere (*15*). Before 11 weeks after injection, no lung tumors were observed in 16 mice; between 12 and 18 weeks, 11 out of 21 mice had multiple lung tumors, and of the 16 mice killed after 18 weeks, all but one had multiple lung tumors.

DISCUSSION

The investigation demonstrates that the solvent exerts a definite effect upon the latent period and incidence of carcinogenesis with methylcholanthrene injected subcutaneously in the dissolved state into inbred strains of mice. The latent period is very short when tricaprylin is used, and over twice as long when butyl phthalate is the solvent.

It is evident, therefore, that solvents of heterogenous composition, such as lard, will not produce constant results with different lots of the material. Significant variation can be elicited even with relatively large doses of methylcholanthrene (0.5 mg.) in very susceptible animals (C_3H mice). The variations are accentuated when smaller doses of the carcinogen, or carcinogens of weaker potency, are injected into less susceptible animals (*16*).

Another important argument against the use of heterogenous solvents in studies of carcinogenesis with the hydrocarbons is found in the reports of occasional sarcomas obtained at the site of injection of such compounds. Burrows and his coworkers (*17*) describe 12 spindle-cell tumors in 217 rats injected with lard, and Gardner (*18*) reports the production of a sarcoma in one mouse that received repeated injections of sesame oil. Although it is possible that such tumors are of spontaneous origin (*19*), the sarcomas could be the result of nonspecific action or of some undetermined weak carcinogen in the agents. The use of a solvent of known chemical composition obviates the latter possibility.

Tricaprylin, $C_3H_5(OCO(CH_2)_6CH_3)_3$, was the most consistently and most rapidly acting solvent for methylcholanthrene of the five esters tested. It is a colorless, odorless liquid with a melting point of 8–9° C. It dissolves methylcholanthrene rapidly in concentrations of 5 mg. per cc.; 10 mg. per cc. is a supersaturated solution at 37° C. and precipitates at 20° C. The chief disadvantage of tricaprylin as a solvent for polynuclear aromatic hydrocarbons is its present high cost. The experiments reported here have stimulated the development of methods of cheaper large-scale production of the compound (*20*).

SUMMARY

The solvent exerts a definite effect upon the incidence and the latent period of sarcogenesis with 20-methylcholanthrene in inbred strains of mice.

Significant differences are observed in the production of tumors when different lots of lard are used as solvents for methylcholanthrene.

Tricaprylin was found to be a most satisfactory solvent of known chemical composition for studies in carcinogenesis with methylcholanthrene.

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THE PRESERVATION OF THE INFECTIOUS AGENTS OF SOME OF THE RICKETTSIOSES

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In 1935 Flosdorf and Mudd (*1*) described the procedure and apparatus for preservation in "lyophile" form of serum and other biological substances. Since this report there have been many published communications increasing the wide adaptability of the procedure. In 1938 the same two authors described the "cryochem process" (*2*) as an improved method for the preservation of sera, microorganisms, and other substances. The purpose of this paper is to

add another to the already imposing list of materials and substances which lend themselves to satisfactory preservation by either of these two methods, namely, the infectious agents of some of the rickettsioses.

There have been only two satisfactory methods available to the investigator for the maintenance of strains. The first is by constant animal passage, which is exceedingly tedious and expensive and is attended by the constant danger of loss of the strain from secondary infections in the passage animals. The second method is the utilization of some form of tissue culture such as those described by Bengtson (*3a* and *b*), Cox (*4*), and Zinsser (*5*). This second method has disadvantages somewhat similar to the first. The adaptability of this type of material to its preservation by either the "lyophile" or "cryochem" procedures has obvious advantages.

Material has been successfully preserved in the lyophile state from animals or arthropods infected with Rocky Mountain spotted fever, endemic typhus, epidemic typhus, and the rickettsiae recently described by Cox (*R. diaporica*). These four strains represent a wide variety of the rickettsioses and, in general, are representative of the total group.

It has been found that guinea pig serum virus loses its infectivity when subjected to the lyophile state. This is due, perhaps, to changes in pH as suggested by Scherp et al. (*6*) in a report on the influenza virus. Bits of tissue alone, such as strips of spleen in spotted fever, or portions of the brain in epidemic typhus, are also unsatisfactory. Emulsions of organs in saline, too, have immediately lost their infectivity except those from guinea pigs infected with *R. diaporica*, which infection apparently is more resistant to rough handling than the other strains of the rickettsioses.

Sterile skimmed milk has been found to be the best medium in which to suspend infectious material. Briefly, the technique is as follows: The infected animal is anesthetized with ether, opened, blood cultures made, then the organ or material removed. This is macerated in a sterile mortar and about 12 cc. of sterile skimmed milk added. The material is then divided into four equal portions of 3 cc. each and placed in the 5-ml. cryochem or lyophile tubes. The described procedures for preservation are followed. The spleen has been found to be the best material in spotted fever and animals infected with *R. diaporica*, the brain in epidemic typhus, and testicular washings in endemic typhus. The characteristic disease is produced upon testing with no apparent change in virulence as indicated by incubation periods, fatality rates, and scrotal lesions. Animal organs infected with endemic typhus and *R. diaporica* have been preserved for 5 months, Rocky Mountain spotted fever for 1 month, and epidemic typhus for 4 months. Spotted fever virus in ticks has been preserved for 4 months. Tests covering longer periods have not been made.

It has been noted that the contents of an occasional tube, when tested, will fail to infect the animals, while other materials from the same source and preserved at the same time do prove infectious. To overcome this difficulty, it is believed advisable to preserve at least four to eight lots at one time so that duplicates will be available.

When any of the tested material has failed to infect a test animal, it subsequently has been shown that the animal was not usually immunized by the injection of the noninfecting virus. It would seem that the destruction of the infectious agent has also destroyed its antigenicity. However, one test with "tick virus" of Rocky Mountain spotted fever in the lyophile state in milk failed to infect two guinea pigs and these animals later were found to be immune to passage virus.

CONCLUSION

The "lyophile" or "cryochem" technique offers an economical and convenient method for the preservation of rickettsial material.

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HOUSING AND HEALTH RELATIONSHIPS RE-EXAMINED

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"Housing" connotes more than the mere condition, design, arrangement, and construction of buildings. It means the conditions under which people carry on their daily life, in their homes and in their neighborhoods. It means the general environment as well as the buildings. Concrete examples of what housing means today are found in the public housing projects, nonexistent a decade ago. These projects are undertaken to provide the kind of environment that favors physical and mental health. They insure essentials in wise site plan-

ning such as low percentage of land occupancy by buildings and the orientation of structures so that the maximum amount of sunshine will be afforded. Provision is made for sufficient window area and such arrangement of windows as will give maximum ventilation; for insulation against heat and cold; arrangement of rooms for maximum privacy; modern toilet and bathing facilities for every dwelling unit; hot as well as cold running water; efficient heating; laundry facilities; fire-resistant construction and safe egress. Thought is given not only to minimizing conditions that are conducive to falls and accidents, but to providing the kind of management that will insure the maintenance of the buildings in a good state of repair. With elimination of overcrowding it is possible to direct the attention of tenants to habits of cleanliness and orderly housekeeping. Projects are planned to include ample room for adult recreation and convenient play space for children.

Viewed in this broad light, few health leaders would question that good housing does promote good health. At the same time, recognized housing leaders do not discount the fact that health is vitally affected by other factors, such as adequate income, proper diet, good medical service, cleanliness, the knowledge and practice of the rules of hygiene, and conditions of employment.

HOUSING AND DISEASE

A clear understanding of the possible relationship between housing and disease may be facilitated by the following statement from a recent paper (*1*) on the influence of overcrowding on the incidence of pneumonia:

> The factors responsible for the production of disease, especially infectious disease, must be considered from three important angles.
>
> (*a*) Predisposing causes which include, among others, age, sex, habits, season, heredity, hygiene, climate, other diseases, poverty, and housing.
> (*b*) Exciting causes—heat, cold, trauma, worry.
> (*c*) Specific causes—micro-organisms, viruses, toxins, etc.
>
> It is likely that these three factors, acting together, set the stage, necessary for the contraction of the disease.

There is much evidence that bad housing and bad environment are predisposing factors in the spread of disease. Examples of specific diseases in some measure attributable to bad housing are discussed in the paragraphs which follow.

Tuberculosis.—Of course, poor housing does not cause tuberculosis. It is a disease caused by a germ and the commonest type (pulmonary) is spread from person to person. Whether or not housing is an important factor in promoting the spread of tuberculosis is debatable, since the relationship is not susceptible of exact measurement. Low income, lack of knowledge and practice of the rules of hygiene, and

unfavorable industrial conditions contribute to the spread of the disease, perhaps even to a greater extent than bad environment. Yet there is strong evidence that environment does play a part.

Emerson (*2*) makes this observation: "In Detroit (1920–29) and New York (1922–30) in this country, and in Glasgow and Edinburgh careful studies have shown that increased prevalence of reported cases or deaths from pulmonary or other forms of tuberculosis is related directly under these conditions (where people are of low economic levels or of mediocre intelligence) to houses unsuitably constructed, and occupied with an excessive ratio of persons to rooms. Among industrial workers in Cincinnati, the United States Public Health Service found that bad housing had a marked effect on the tuberculosis rate which was, in turn, affected by poverty, lack of segregation of advanced sputum cases, and lack of provision for incipient cases."

Since the "white plague" is spread from person to person, room overcrowding is certainly conducive to its spread. One of the aims of the housing movement, even before public housing projects were undertaken, was the elimination of overcrowding.

Groom and Allen (*3*) have shown, from studies in Cincinnati, that tuberculosis mortality varies in direct relation to economic status. The Cincinnati Building Department (*4*) rates residences as to fitness. Allen's studies show high tuberculosis mortality rates for all the major residential areas classified by the building department as distinctly substandard. It is true that these are also low economic areas and there is no doubt that economic status is just as important, or even more so, than the environment. Areas of high tuberculosis mortality are found so constantly to be areas of bad environment that a relationship is indicated in spite of the impossibility of separating the economic from the environmental factors.

A report published in 1938 by the Garden Cities and Town Planning Association of England (*5*) makes certain comparisons of tuberculosis mortality. According to this report the tuberculosis death rate for slum areas of Manchester was 197 per 100,000; for the city of Manchester as a whole, 104; for the Wythenshawe housing development (a public housing project), 72; and for England's 2 most famous garden cities, 38 and 57, respectively. The economic status of families in the Wythenshawe development and in the garden cities is probably higher than that of the slum families, but there is no reason for believing that it is higher than for the city of Manchester as a whole, especially in Wythenshawe whose families are selected because of low income. These data justify a reasonable presumption that satisfactory housing and environment are conducive to lower tuberculosis mortality.

Pneumonia.—Accumulating evidence is establishing a relationship between environment and pneumonia. Recent information compiled by Benjamin (*1*) indicates that pneumonia incidence as well as mortality is excessive in areas of substandard housing and room overcrowding. His studies show a significant correlation between high pneumonia mortality rates and a high degree of room overcrowding in a group of cities.

Benjamin's studies have further demonstrated, by means of a spot map, that the vast majority of pneumonia cases received at the Cincinnati hospitals, public and private, come from the substandard, overcrowded areas of the city where about one-fourth of the population lives.

Rickets.—It has been demonstrated by scientific workers that, while rickets varies with climate and season, its incidence is increased by residence in dark, damp houses and by lack of opportunity for outdoor exercise for young children. Walker (*6*) in Detroit found a correlation between insufficient daylight (less than 0.25 percent of outside light) and the prevalence of rickets. Rickets was rarely found where daylight in the living room was as much as 0.50 percent of outside sunlight.

Infant and maternal mortality.—In the report previously referred to, published by the Garden Cities and Town Planning Association of England (*5*), these facts with regard to infant mortality are brought out. The infant mortality in the slum areas of Manchester was 120 per 1,000 live births; in the city of Manchester as a whole, it was 71; in the Wythenshawe development, 60; and in the 2 garden cities, 33 and 25, respectively. Here again, while the economic factor is not evaluated, there seems to be no reason to believe that, in a housing development like Wythenshawe where tenants are selected because of low income, or in the garden cities where families are of the wage-earner group, the family status should be any better than that of families in the city of Manchester.

Diarrheal diseases take an excessive toll among babies in areas of bad housing and low income. Undoubtedly, low income, diet, and ignorance are vital factors. However, in considering tenement areas, such as those studied in Cincinnati, high incidence of diarrheal disease may be attributed in part to conditions existing because of use of common toilets, many of them broken and out of order, and to the high percentage of unscreened windows in the area. It is significant that Cincinnati's mortality (*3*) from diarrheal diseases is high and its percentage of private indoor toilets is low in comparison with other cities (*7*). Part II of the Cincinnati studies, which concerned mortality by census tracts, states: "There was a very definite localization of high (enteritis) death rates; geographically they centered in the Basin (where the greatest congestion and the worst housing exist,

and where 69.1 percent of the households are without private, indoor toilets); economically, they involved mainly the underprivileged class."

Pediatricians agree that in order to safeguard the health of infants, homes that have adequate sanitary and bathing facilities, including running hot and cold water, light, well-lighted and ventilated rooms with screened windows, and proper heating equipment are requisite, and that lack of these essentials is a menace to the health of babies.

Typhoid fever.—In most of our larger cities, owing to the safeguarding of the water and milk supplies and to sanitary sewage disposal, typhoid fever is no longer a serious problem. It remains a problem, however, in smaller communities where there is no public water supply or where the public water supply is not properly protected from contamination. In these communities the existence of privy vaults is a factor in the spread of typhoid fever.

Disease spread by rats.—It has long been realized by public health administrators that rat bites are much more common than generally supposed. Frequently, in old tenement districts, babies and small children are seriously bitten while sleeping. Rat extermination measures have been necessary on many slum sites cleared for public housing projects. Modern building and housing codes require provisions to minimize the rat menace in new buildings.

The rat has an important role in the direct or indirect transmission of such diseases as plague, typhus fever, tularaemia, trichinosis, rat-bite fever, and Weil's disease. To be sure, rats breed in many types of buildings other than dwellings. Nevertheless, slum elimination and replacement by rat-resistant structures aid in the reduction of this menace.

Rheumatic fever.—Authorities on rheumatic fever point out that this disease is closely associated with poverty and bad environment. The references on this score are abundant in medical literature (*8*).

Mental health and environment.—There seems to be no specific evidence as to the relative prevalence of minor nervous disorders in substandard housing areas as compared with other areas. Nevertheless, conditions existing in slum environment are not such as to promote mental health. Ford (*9*) points out that "Nervous impairment is a disability sometimes occasioned by eye strain, by dark halls and rooms. The insistent noise and confusion almost invariably present in substandard housing areas is bad. Lack of privacy in arrangement of rooms and overcrowding people in rooms is certainly undesirable for the best mental, moral, and spiritual development. The lack of a place for home study adds difficulties for the child in matters of normal mental adjustment."

Facts indicating a relationship between one form of insanity (schizophrenia) and environment have been presented in a paper published recently by the University of Chicago. The study of

mental disease in the city of Chicago, made by Faris (*10*), was based on the records of the Chicago Psychopathic Hospital for 1930 and for 1939. It showed that insanity rates during the year 1930 varied in different parts of the city from 19 to 828 per 100,000 of the population, with an average of 105 for the city as a whole. Faris states, "The high rate areas include the central 'zone of deterioration' where the foreign-born population reside, the 'hobo' and rooming house areas, and the Negro rooming-house and apartment-house areas. The low rates are in the outlying residential areas, including the suburban zone, the areas in which single houses predominate, and the areas of the more expensive apartment houses. Thus it is clearly evident that there is at least a crude association between the high rates of insanity and the parts of the city in which social disorganization is greatest * * *."

Housing and accident hazards.—In the volume "Slums and Housing," Ford (*9*) produces detailed evidence showing that the design, construction, and maintenance of dwellings have a direct bearing on the number of injuries from accidental falls. In the large-scale housing developments undertaken by public and private enterprise today, every effort is made to eliminate these particular hazards.

Ford points to fires as a cause of many accidents, injuries, and even deaths. Home accidents due to dilapidation and fire are also discussed by Britten (*11*). Since one of the aims of planned housing is to require the construction of buildings in such manner as to prevent injuries and deaths due to fire and to provide safe and adequate egress, the relationship between housing and fire as an accident hazard seems clear.

HOUSING AND POSITIVE HEALTH

Neither effective treatment of disease nor freedom from disease constitutes the total objective of the public health movement today. It is not enough to increase the life expectancy. There is no great gain in merely extending life if it can be neither useful nor enjoyable. The goal is to try to make the conditions of life such that the mass of the people may be able to enjoy health, vigor, and usefulness to the full. The following may be listed as some of the necessities for the promotion of health in its most complete sense:

Well balanced and adequate diet.
Adequate medical care, preventive as well as curative.
Exercise and wholesome recreation.
Cleanliness.
Fresh air.
Sunshine.
Rest.
Sleep.

Privacy.
Freedom from unnecessary disturbance of the quiet enjoyment of home life.
Working conditions conducive to health.

This is not a complete or exhaustive list by any means. It is significant, however, that conditions in substandard housing areas of our cities are adverse factors in more than half of these essentials, whereas the conditions that modern housing endeavors to promote are favorable.

Significant studies of housing in relation to health, which touch upon many of the above matters, are being made by the Committee on the Hygiene of Housing of the American Public Health Association. The studies are unique. They approach the subject from a constructive angle with the purpose of aiding housing directors to make the new housing of today promote health. For example, they include the most comprehensive survey of thermal conditions so far made in occupied buildings in this country. They are bringing to light important facts on ceiling heights, illumination, insulation, occupancy limits, environmental influences, recreation areas in relation to housing developments, and similar matters. Many of the findings of these studies are reflected in a report recently published by the Committee (*12*). The report sets forth the "basic health needs that housing should subserve" and outlines these according to fundamental physiological needs, fundamental psychological needs, protection against contagion, and protection against accidents.

It is apparent from the report that the newer concept of housing is concerned with positive health, and, as such, transcends consideration of the mere physical structure and embraces environmental conditions as well. This attitude has, perhaps, best been summed up by Dr. C.-E. A. Winslow, Professor of Public Health, Yale University, at a recent round table discussion held under the auspices of the Milbank Memorial Fund (*13*), at which he said: "In this connection, the round table desires to underline its conviction that the whole philosophy of the modern housing program rests upon the ideal of rebuilding our cities. Mere shelter is not enough, and while the rehabilitation of substandard dwellings and the building of temporary shelters for the unemployed may be useful, it is not housing in the proper sense. Any Government program in this field has fallen woefully short of its objective if it does not create decent conditions of human living in the neighborhood as well as within the walls of the dwelling itself." At this same round table, Dr. George C. Ruhland, Health Commissioner, Washington, D. C., expressed a similar conviction in stating: "It is, I feel, rather fortunate that the health officer's attention is diverted from the altogether too narrow viewpoint of the specific bacterial causes of disease to the broader aspects of environmental influences

such as are involved in the housing projects under discussion here today."

If we are able ever to produce a "slumless America" we shall certainly not eliminate all preventable disease any more than we shall eradicate all delinquency. There are too many other factors involved. Yet the evidence is overwhelming that slum environment acts as a barrier to the efforts of public health authorities to control preventable illness among slum dwellers to the extent possible among the well housed. Insofar as we break down that barrier, we make one more step toward the objective of "health for all the Nation."

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(12) Basic Principles of Healthful Housing. Committee on the Hygiene of Housing, American Public Health Association. Am. J. Pub. Health, 28:351–372 (March 1938).
(13) New Light on an Old Problem. Milbank Memorial Fund, 1939.

COURT DECISION ON PUBLIC HEALTH

Tax by public health district upheld.—(Illinois Supreme Court; *People ex rel. Wangelin, County Collector*, v. *Pennsylvania R. Co.*, 23 N.E.2d 38; decided October 13, 1939.) The statutes of Illinois relating to public health districts made it the duty of each board of health to levy annually a special public health tax, not to exceed 1½ mills on the dollar, to form a public health fund from which to pay

the salaries of the health officer and employees and the expense of maintenance of the health department. The statutes also provided that each board of health should transmit annually to the county clerk a certificate "setting forth the rate or percentage of such taxes by them levied for the purposes herein provided." The records of the board of health of a particular health district showed that a resolution was adopted levying a special public health tax at the rate of 1½ mills "for the purposes provided in" the public health district act, quoting its title, and calling for the preparation by the secretary of a certificate of levy in the form set out in the resolution. A certificate was filed with the county clerk reciting the levy at the rate specified "for the purposes provided in" the public health district act, again quoting its title. Neither the board's minutes nor the certificate of levy showed any total amount required to be raised or any itemized separate purposes with the amounts to be used for each purpose.

In a tax proceeding against the defendant railroad company the levy was sustained against objections that it was void because (1) the taxing district's records did not show the total amount of money to be raised or the specific purposes and amounts for each purpose or whether they were lawful purposes, and (2) the certificate of levy was by rate instead of by amount. In rejecting the defendant's contentions the supreme court in its opinion stated, in part, as follows:

* * * The exclusive purpose for which the levy was made, and shown by the minutes, is the creation of a fund to preserve the public health, specifically authorized by the particular statute under which it was levied, and referred to both in the minutes of the board and in the levy. The taxpayers were fully informed of the legality of the purpose by the record and by the levy. * * *

It is to be noted that the statute under which the levy was made provides for a levy by rate, and that the certificate of levy shall be made in the same way. These provisions were complied with. * * *

DEATHS DURING WEEK ENDED MARCH 9, 1940

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

	Week ended Mar. 9, 1940	Corresponding week, 1939
Data from 88 large cities of the United States:		
Total deaths	9,365	9,688
Average for 3 prior years	9,460	
Total deaths, first 10 weeks of year	96,048	95,246
Deaths under 1 year of age	460	553
Average for 3 prior years	579	
Deaths under 1 year of age, first 10 weeks of year	5,306	5,557
Data from industrial insurance companies:		
Policies in force	66,069,866	67,823,716
Number of death claims	15,103	17,982
Death claims per 1,000 policies in force, annual rate	12.0	13.8
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10.7	10.6

PREVALENCE OF DISEASE

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

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 23, 1940

Summary

For the current week, a continuation of the favorable conditions is noted with respect to the 9 important communicable diseases reported to the Public Health Service weekly by telegraph by the State health officers. Each of the diseases included in the following table, with the exception of poliomyelitis, was below the 5-year median, 1935–39, and the accumulated totals for the first 12 weeks of the year (period ended with the current week) are below the 5-year median expectancy for all of the diseases except influenza and poliomyelitis.

The number of cases of influenza dropped from 6,740 for the preceding week to 4,438 for the current week, below the 5-year median of 6,359, while poliomyelitis increased from 19 to 28 cases, much above the median expectancy of 17 cases. The prevalence of poliomyelitis is widely distributed, with only 3 States, California, Kentucky, and Michigan, reporting as many as 3 cases. The number of diphtheria cases, 289, was little more than half the expectancy, while smallpox, with 72 cases, and typhoid fever, with 89 cases, were well below the median figures of 272 and 110, respectively.

For the current week, 1 case of Rocky Mountain spotted fever was reported in Oregon, 2 cases of tularaemia were reported in Maryland, and 1 case each in South Carolina and Mississippi, and 14 cases of endemic typhus fever were reported, 6 in Texas, 4 in Georgia, 3 in Alabama, and 1 in South Carolina.

Telegraphic morbidity reports from State health officers for the week ended March 23, 1940, and comparison with corresponding week of 1939 and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39
	Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939	
NEW ENG.												
Maine	0	0	2	2	54	13	270	18	75	1	0	0
New Hampshire	0	0	0	------	------	------	93	0	8	0	0	0
Vermont	0	1	1	------	------	------	6	24	24	0	0	0
Massachusetts	3	3	3	------	------	------	386	993	782	0	1	4
Rhode Island	0	1	0	------	------	------	143	18	31	0	0	1
Connecticut	4	2	5	7	133	16	68	690	573	0	0	0
MID. ATL.												
New York	19	30	38	[1] 28	[1] 60	[1] 32	479	1,615	2,433	5	0	14
New Jersey	2	4	13	11	12	12	167	46	1,156	1	1	2
Pennsylvania	13	52	40	------	------	------	149	130	952	5	7	6
E. NO. CEN.												
Ohio	4	6	21	14	------	13	9	22	264	0	0	5
Indiana	8	11	12	57	155	49	11	14	84	1	1	2
Illinois	23	24	33	16	326	49	104	20	81	3	1	5
Michigan [2]	2	10	11	1	208	6	289	245	245	5	2	3
Wisconsin	1	0	3	189	969	75	355	769	769	0	1	1
W. NO. CEN.												
Minnesota	0	0	2	2	34	1	214	672	349	1	0	0
Iowa	3	8	8	9	299	12	147	95	95	0	0	1
Missouri	3	10	21	8	144	144	6	18	27	0	0	3
North Dakota	2	2	1	62	414	6	3	64	64	0	0	0
South Dakota	1	0	0	2	40	------	2	170	2	0	0	0
Nebraska	2	3	3	------	7	1	15	165	85	0	1	1
Kansas	6	7	11	14	70	16	628	29	29	0	0	1
SO. ATL.												
Delaware	0	0	0	------	1	1	0	4	8	0	0	0
Maryland [2]	0	2	6	30	19	23	2	736	175	1	0	5
Dist. of Col	13	3	13	2	3	3	1	68	68	1	1	2
Virginia	11	12	14	501	1,766	------	113	524	427	1	7	7
West Virginia [2]	6	10	10	229	118	118	12	8	20	7	3	4
North Carolina	7	23	12	34	105	105	136	1,313	613	0	5	5
South Carolina [2]	7	14	6	559	1,636	689	15	27	36	1	1	1
Georgia [2]	11	8	10	141	565	565	73	128	0	1	1	1
Florida	8	1	5	10	19	19	178	83	68	1	0	1
E. SO. CEN.												
Kentucky	6	6	8	38	412	100	137	19	151	5	1	7
Tennessee	5	3	8	117	516	184	41	28	75	0	1	7
Alabama [2]	4	17	12	269	2,154	1,330	152	210	210	2	2	5
Mississippi [2]	7	7	6	------	------	------	------	------	------	0	1	0
W. SO. CEN.												
Arkansas	15	8	8	187	1,031	349	13	88	88	1	0	3
Louisiana	8	11	15	14	64	70	0	162	84	2	2	2
Oklahoma	6	10	7	165	466	168	11	191	86	2	0	2
Texas [2]	32	31	43	1,277	1,773	949	800	290	392	1	5	5
MOUNTAIN												
Montana	13	1	1	4	406	7	20	250	73	1	0	0
Idaho	0	0	0	------	------	6	145	82	25	0	0	0
Wyoming	2	0	0	2	2	------	86	53	33	0	0	0
Colorado	9	9	4	23	74	------	19	234	234	0	0	0
New Mexico	0	4	4	11	198	1	14	68	54	1	2	2
Arizona	2	0	2	180	307	102	122	20	29	0	0	0
Utah [2]	2	0	0	15	71	------	718	127	20	0	0	0
PACIFIC												
Washington	1	1	1	------	20	16	1,026	668	203	0	0	1
Oregon [1]	3	2	2	27	63	63	570	68	68	0	0	2
California	15	23	30	181	239	221	260	4,513	984	0	4	4
Total	289	380	504	4,438	14,953	6,359	8,208	15,779	15,779	50	51	159
12 weeks	4,668	6,208	7,301	144,942	100,056	89,257	67,982	152,500	152,500	478	638	1,479

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 23, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39
	Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939		Mar. 23, 1940	Mar. 25, 1939	
NEW ENG.												
Maine	0	0	0	12	24	17	0	0	0	0	1	2
New Hampshire	0	0	0	1	4	12	0	0	0	0	0	0
Vermont	0	0	0	6	10	20	0	0	0	0	0	0
Massachusetts	0	0	0	141	194	289	0	0	0	0	0	2
Rhode Island	0	0	0	16	12	29	0	0	0	0	0	1
Connecticut	0	0	0	71	108	117	0	0	0	4	0	1
MID. ATL.												
New York	0	0	0	1,190	699	1,056	0	0	0	3	4	8
New Jersey	0	0	0	390	225	177	0	0	0	3	4	1
Pennsylvania	1	0	0	377	417	562	0	0	0	3	14	7
E. NO. CEN.												
Ohio	1	0	1	225	310	367	5	21	3	3	3	2
Indiana	1	0	0	196	182	182	6	37	8	1	0	0
Illinois	0	2	2	833	503	779	2	5	19	4	8	6
Michigan [2]	3	0	0	287	508	508	1	12	12	5	0	2
Wisconsin	1	0	0	134	201	432	0	5	6	1	0	1
W. NO. CEN.												
Minnesota	0	0	0	82	97	190	5	7	13	0	0	1
Iowa	0	0	1	45	145	224	13	22	27	1	1	2
Missouri	0	1	0	47	109	211	8	22	22	3	0	2
North Dakota	0	0	0	16	7	33	1	1	4	1	0	0
South Dakota	0	0	0	18	18	18	4	1	3	1	0	0
Nebraska	0	0	0	15	31	42	0	7	14	0	0	0
Kansas	1	0	0	64	148	148	1	2	23	2	2	0
SO. ATL.												
Delaware	0	0	0	16	9	9	0	0	0	0	0	0
Maryland [3]	0	0	0	39	39	86	0	0	0	1	2	2
Dist. of Col	0	0	0	37	16	19	0	0	0	1	0	0
Virginia	1	0	0	40	17	30	0	0	0	4	1	1
West Virginia [3]	1	0	0	46	33	52	1	0	0	2	5	5
North Carolina	0	0	0	39	51	39	0	0	0	2	5	2
South Carolina [3]	0	4	0	1	5	5	0	0	0	0	3	2
Georgia [3]	1	0	1	18	7	8	0	1	0	1	4	2
Florida	0	2	0	15	11	6	0	0	0	2	2	1
E. SO. CEN.												
Kentucky	3	0	1	105	90	68	0	2	0	4	1	2
Tennessee	0	0	0	93	37	29	0	3	0	2	1	2
Alabama [3]	0	1	1	9	30	12	1	4	1	2	1	1
Mississippi [3]	0	0	0	2	9	9	0	0	0	6	3	1
W. SO. CEN.												
Arkansas	2	1	0	6	8	10	3	3	1	0	6	1
Louisiana	0	0	0	15	11	13	0	1	1	3	15	9
Oklahoma	2	1	0	20	38	30	1	33	2	1	2	1
Texas [3]	1	0	1	49	89	83	6	29	14	11	14	9
MOUNTAIN												
Montana	2	0	0	21	18	18	0	0	14	1	0	0
Idaho	0	0	0	3	9	15	0	2	2	0	1	1
Wyoming	0	0	0	7	3	20	1	0	0	1	1	0
Colorado	0	0	0	37	29	61	6	2	2	0	1	1
New Mexico	1	0	0	3	28	28	0	0	1	1	0	2
Arizona	2	1	0	13	7	18	0	8	0	0	0	0
Utah [3]	0	0	0	15	21	50	0	1	1	0	0	0
PACIFIC												
Washington	0	0	0	47	45	46	1	1	11	2	0	0
Oregon [4]	1	1	0	18	54	49	2	14	14	4	3	2
California	3	0	0	138	246	240	4	24	14	3	2	2
Total	28	14	17	5,018	4,912	7,410	72	270	272	89	110	110
12 weeks	334	184	248	56,107	63,907	80,773	882	4,520	3,654	916	1,406	1,406

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 23, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Whooping cough	
	Week ended	
	Mar. 23, 1940	Mar. 25, 1939
NEW ENG.		
Maine	84	55
New Hampshire	15	0
Vermont	38	32
Massachusetts	104	254
Rhode Island	2	124
Connecticut	23	106
MID. ATL.		
New York	382	545
New Jersey	65	418
Pennsylvania	263	292
E. NO. CEN.		
Ohio	76	146
Indiana	44	46
Illinois	114	281
Michigan [2]	129	153
Wisconsin	84	225
W. NO. CEN.		
Minnesota	22	43
Iowa	1	14
Missouri	27	16
North Dakota	1	9
South Dakota	2	1
Nebraska	4	6
Kansas	39	19
SO. ATL.		
Delaware	14	12
Maryland [2]	253	21
Dist. of Col	14	35
Virginia	40	77
West Virginia [2]	27	26
North Carolina	77	363
South Carolina [3]	26	111
Georgia [3]	14	35
Florida	21	87
E. SO. CEN.		
Kentucky	53	7
Tennessee	29	13
Alabama [3]	4	82
Mississippi [3]	----------	----------
W. SO. CEN.		
Arkansas	7	34
Louisiana	1	20
Oklahoma	8	1
Texas [3]	255	104
MOUNTAIN		
Montana	2	1
Idaho	11	1
Wyoming	0	1
Colorado	6	96
New Mexico	12	13
Arizona	25	27
Utah [3]	200	40
PACIFIC		
Washington	72	22
Oregon [4]	39	8
California	205	179
Total	2,934	4,201
12 weeks	34,738	50,641

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 23, 1940, 14 cases as follows: South Carolina, 1; Georgia, 4; Alabama, 3; Texas, 6.
[4] Rocky Mountain spotted fever, week ended Mar. 23, 1940, Oregon, 1 case.

CASES OF VENEREAL DISEASES REPORTED FOR JANUARY 1940

Reports from States

	Syphilis									Gonorrhea		Other venereal diseases	
	Early			Late		Congenital		All syphilis					
	Primary and secondary	Early latent [2]	Rate per 10,000 population	Includes late latent	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population
Alabama [3]													
Alaska [3]													
Arizona	35	12	1.12	43	1.03	5	0.12	95	2.27	39	0.93		
Arkansas	95	97	.93	81	.39	12	.06	535	2.58	161	.78	4	0.02
California		[4] 485	.78	1,416	2.26	86	.14	2,107	3.37	1,673	2.67	24	.04
Colorado	40		.37	48	.45	6	.06	102	.95	66	.61		
Connecticut	25	9	.19	77	.44	16	.09	175	1.00	119	.68	1	.01
Delaware	9	18	1.03	46	1.75	3	.11	201	7.64	42	1.60		
District of Columbia								538	8.46	300	4.72	4	.06
Florida	38	429	2.75	1,077	6.34	43	.25	1,756	10.34	119	.70	8	.05
Georgia		1,383	4.44	497	1.60			1,880	6.04	86	.28	5	.02
Hawaii	2		.05	39	.96	3	.07	65	1.60	64	1.58		
Idaho	21		.42	34	.68	2	.04	61	1.22	9	.18	1	.02
Illinois	100	418	.65	1,370	1.73	66	.08	1,954	2.47	1,132	1.43	21	.03
Indiana	57	27	.24	128	.37	18	.05	344	.99	91	.26	2	.01
Iowa	72	56	.50	119	.46	8	.03	267	1.04	170	.66	1	.01
Kansas	48	62	.59	21	.11	5	.03	191	1.02	116	.62		
Kentucky	134	264	1.35	77	.26	30	.10	668	2.26	384	1.30	1	.01
Louisiana								258	1.20	57	.27	3	.01
Maine	9		.10	13	.15	1	.01	23	.27	24	.28		
Maryland	83	78	.96	169	1.00	21	.12	469	2.78	145	.86	22	.13
Massachusetts	58		.13	[5] 353	.80	20	.05	431	.97	342	.77		
Michigan [3]													
Minnesota	26	11	.14	167	.63	16	.06	220	.82	172	.64		
Mississippi								1,775	8.70	2,244	11.00		
Missouri								311	.77	76	.19		
Montana	19		.35	10	.18	3	.05	44	.80	16	.29		
Nebraska	27	8	.26	21	.15	4	.03	60	.44	32	.23		
Nevada	2		.20	13	1.27			15	1.47	17	1.67	1	.10
New Hampshire	3		.06	6	.12	3	.06	19	.37	14	.27		
New Jersey	115	141	.59	525	1.20	63	.14	905	2.07	251	.58	64	.15
New Mexico [3]													
New York	283	125	.32	2,116	1.63	141	.11	2,906	2.25	1,290	1.00	16	.01
North Carolina [3]													
North Dakota	3		.04	3	.04	2	.03	17	.24	20	.28		
Ohio	208	152	.53	497	.74	43	.06	900	1.33	355	.53	7	.01
Oklahoma	334	675	3.93	1,400	5.45	189	.74	3,192	12.42	255	.99		
Oregon	38	26	.62	65	.63	12	.12	144	1.39	160	1.54		
Pennsylvania	129	323	.44	126	.12	47	.05	625	.61	76	.07		
Rhode Island	13		.19	35	.51	4	.06	88	1.29	37	.54		
South Carolina								649	3.43	606	3.20	2	.01
South Dakota	14		.20	12	.17	1	.01	42	.61	28	.40		
Tennessee	249	195	1.52	307	1.05	18	.06	776	2.65	315	1.08	10	.03
Texas	290	283	.92	888	1.43	69	.11	2,028	3.25	929	1.49	81	.13
Utah	12	7	.36	22	.42	1	.02	44	.84	45	.86		
Vermont [3]													
Virginia								1,439	5.25	236	.86		
Washington	22	10	.19	28	.17	5	.03	66	.39	119	.71		
West Virginia								186	.98	86	.45		
Wisconsin	10		.03	43	.15			53	.18	85	.29		
Wyoming	7		.30	8	.34	1	.04	24	1.01	8	.34		
Puerto Rico [3]													
Virgin Islands [3]													
Total	2,630	5,294	.77	11,900	1.15	967	.09	28,648	2.40	12,611	1.06	278	.02

See footnotes at end of table.

Reports from cities of 200,000 population or over

	Syphilis								Gonorrhea		Other venereal diseases	
	Early			Late		Congenital		All syphilis				
	Primary and secondary	Early latent	Rate per 10,000 population	Includes late latent	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population	Number	Rate per 10,000 population
Akron	4	7	0.40	20	0.73	2	0.07	33	1.20	19	0.69	----	----
Atlanta	----	205	6.83	15	.50	----	----	220	7.33	----	----	----	----
Baltimore [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Birmingham	79	50	4.38	101	3.43	14	.48	316	10.74	50	1.70	1	0.03
Boston	19	7	.33	83	1.04	8	.10	148	1.86	148	1.86	----	----
Buffalo	19	----	.32	92	1.53	----	----	121	2.01	42	.70	----	----
Chicago	61	169	.63	882	2.41	36	.10	1,148	3.13	716	1.95	20	.05
Cincinnati [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Cleveland	58	29	.91	125	1.32	7	.07	219	2.32	90	.95	4	.04
Columbus	16	12	.89	20	.64	3	.10	51	1.63	37	1.18	1	.03
Dallas [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Dayton	15	8	1.04	16	.72	----	----	39	1.76	30	1.35	----	----
Denver	----	----	----	----	----	----	----	75	2.49	66	2.19	----	----
Detroit [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Houston [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Indianapolis	16	2	.47	9	.23	1	.03	110	2.85	33	.86	----	----
Jersey City	8	3	.34	13	.40	1	.03	25	.77	7	.22	----	----
Kansas City [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Los Angeles	----	118	.78	385	2.53	16	.11	519	3.41	334	2.20	3	.02
Louisville	----	----	----	----	----	----	----	174	5.13	137	4.04	----	----
Memphis [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Milwaukee	3	----	.05	7	.11	2	.03	12	.19	15	.24	----	----
Minneapolis	7	7	.28	45	.90	2	.04	61	1.22	48	.95	----	----
Newark	8	----	.18	204	4.49	6	.13	218	4.80	80	1.76	16	.35
New Orleans	----	----	----	----	----	----	----	86	1.76	45	.92	5	.10
New York	177	125	.40	1,039	1.39	77	.10	1,641	2.19	843	1.13	16	.02
Oakland	24	----	.77	55	1.76	1	.03	80	2.56	64	2.04	----	----
Omaha	6	----	.27	3	.13	----	----	9	.40	12	.54	----	----
Philadelphia [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Pittsburgh [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Portland [3]	----	----	----	----	----	----	----	----	----	----	----	----	----
Providence	6	----	.23	22	.85	2	.08	45	1.74	20	.77	----	----
Rochester	----	----	----	----	----	----	----	37	1.08	41	1.20	----	----
St. Louis	68	182	2.97	467	5.54	25	.30	742	8.80	193	2.29	5	.06
St. Paul	----	----	----	----	----	----	----	40	1.39	21	.73	----	----
San Antonio	17	26	1.64	144	5.50	15	.57	202	7.72	70	2.68	2	.08
San Francisco	63	----	.91	118	1.71	7	.10	188	2.73	191	2.77	7	.10
Seattle	15	13	.72	70	1.81	4	.10	102	2.64	143	3.69	1	.03
Syracuse	----	2	.09	70	3.11	7	.31	79	3.50	6	.27	----	----
Toledo	4	5	.29	52	1.67	5	.16	66	2.12	22	.71	1	.03
Washington, D. C.	----	----	----	----	----	----	----	538	8.46	300	4.72	4	.06
Total	693	970	.75	4,057	1.82	241	.11	7,344	2.98	3,823	1.55	86	.04

Figures preliminary and subject to correction.
[1] Includes "Not stated" diagnosis.
[2] Duration of infection under 4 years.
[3] No report for current month.
[4] Break-down for primary, secondary, and early latent, not available.
[5] Includes early latent, late, and late latent.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 9, 1940

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

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	162	787	133	7,581	952	2,381	30	397	21	1,198	----
Current week [1]	90	500	78	1,784	588	1,852	2	342	8	910	----
Maine:											
Portland	1	----	0	42	2	1	0	0	0	1	19
New Hampshire:											
Concord	0	----	0	0	3	0	0	0	0	0	20
Manchester	0	----	0	11	2	3	0	0	0	0	25
Nashua	0	----	0	36	0	0	0	0	0	0	4
Vermont:											
Barre	0	----	0	0	0	2	0	0	0	0	3
Burlington	0	----	0	0	0	0	0	0	0	2	8
Rutland	0	----	0	0	1	0	0	0	0	0	4
Massachusetts:											
Boston	2	----	0	20	21	51	0	10	0	42	257
Fall River	0	----	1	28	1	0	0	0	0	15	36
Springfield	0	----	0	0	1	11	0	0	0	4	33
Worcester	0	----	0	8	6	5	0	1	0	4	53
Rhode Island:											
Pawtucket	0	----	0	2	0	0	0	0	0	0	13
Providence	0	----	0	129	3	14	0	0	0	9	52
Connecticut:											
Bridgeport	0	1	1	0	4	2	0	3	0	0	45
Hartford	0	1	----	1	----	3	0	----	1	3	----
New Haven	1	6	0	0	4	2	0	0	0	0	46
New York:											
Buffalo	0	----	1	2	6	10	0	4	0	6	144
New York	19	40	8	48	99	603	0	76	0	71	1,644
Rochester	0	2	0	3	3	11	0	3	0	9	86
Syracuse	0	----	0	0	3	8	0	0	0	2	56
New Jersey:											
Camden	2	----	0	0	2	5	0	1	0	1	28
Newark	0	3	0	110	8	22	0	3	0	22	127
Trenton	1	----	0	0	6	3	0	1	1	6	39
Pennsylvania:											
Philadelphia	2	4	2	9	25	71	0	25	3	37	536
Pittsburgh	1	2	2	1	17	25	0	4	1	10	156
Reading	0	----	0	1	5	0	0	0	0	17	25
Scranton	0	----	----	1	----	5	0	----	0	0	----
Ohio:											
Cincinnati	1	3	2	0	11	11	0	4	0	11	153
Cleveland	0	80	1	1	18	38	0	13	0	36	216
Columbus	0	2	2	1	9	2	0	3	0	6	123
Toledo	0	1	1	2	1	25	0	7	0	10	82
Indiana:											
Anderson	0	----	0	0	0	0	0	0	0	2	12
Fort Wayne	0	----	1	0	4	2	0	2	0	0	39
Indianapolis	2	----	2	3	7	16	0	5	0	10	114
Muncie	0	----	0	0	2	0	0	0	0	0	20
South Bend	0	----	0	0	0	2	0	0	0	0	15
Terre Haute	0	----	0	0	0	2	0	0	0	0	18
Illinois:											
Alton	0	1	1	0	2	1	0	0	0	1	11
Chicago	8	15	5	26	41	456	0	40	0	40	779
Elgin	0	2	2	0	1	2	0	0	0	0	7
Moline	0	----	0	0	1	3	0	0	0	0	12
Springfield	1	----	0	0	1	4	1	1	0	3	21
Michigan:											
Detroit	1	8	0	22	15	105	0	9	0	45	282
Flint	0	----	0	2	2	12	0	0	0	16	23
Grand Rapids	0	----	1	9	1	17	0	0	1	9	82
Wisconsin:											
Kenosha	0	----	0	1	0	4	0	0	0	0	10
Madison	0	----	0	0	0	4	0	0	0	0	5
Milwaukee	1	----	0	8	10	26	0	3	0	2	119
Racine	0	----	0	1	0	3	0	0	0	0	11
Superior	1	----	0	32	0	0	0	0	0	1	9

[1] Figures for Frederick and Tacoma estimated; reports not received.

City reports for week ended March 9, 1940—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	172	3	1	0	0	0	0	21
Minneapolis	0	------	4	0	4	18	0	1	0	9	125
St. Paul	0	------	0	3	11	7	0	0	0	17	67
Iowa:											
Cedar Rapids	0	------	--------	10	-------	3	0	-------	0	0	--------
Davenport	0	------	--------	7	-------	4	0	-------	0	0	--------
Des Moines	0	------	0	5	0	10	3	0	0	0	44
Sioux City	0	------	--------	0	-------	4	0	-------	0	2	--------
Waterloo	0	------	--------	2	-------	3	0	-------	0	1	--------
Missouri:											
Kansas City	0	1	2	2	6	24	0	6	0	1	115
St. Joseph	0	------	0	0	4	2	0	1	0	1	36
St. Louis	4	4	2	1	12	16	0	3	0	16	189
North Dakota:											
Fargo	0	------	0	0	2	4	1	0	0	0	8
Grand Forks	0	------	--------	0	-------	0	0	-------	0	4	--------
Minot	0	------	0	4	0	1	0	0	0	0	5
South Dakota:											
Aberdeen	0	------	--------	0	-------	0	0	-------	0	0	--------
Nebraska:											
Lincoln	0	------	--------	1	-------	2	0	-------	0	0	--------
Omaha	1	------	0	3	7	5	0	0	0	1	59
Kansas:											
Lawrence	0	------	0	0	1	0	0	0	0	0	3
Topeka	0	1	1	0	1	1	0	0	0	0	14
Wichita	0	2	0	335	3	0	0	0	0	2	21
Delaware:											
Wilmington	0	------	0	0	4	6	0	1	0	3	36
Maryland:											
Baltimore	1	24	4	2	21	28	0	17	0	230	276
Cumberland	0	------	0	0	0	0	0	0	0	0	17
Frederick	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Dist. of Col.:											
Washington	6	------	0	0	12	35	0	9	0	24	171
Virginia:											
Lynchburg	1	------	0	0	0	3	0	0	0	7	10
Norfolk	2	34	0	1	6	3	0	1	1	1	31
Richmond	1	------	0	1	0	0	0	0	0	0	50
Roanoke	0	------	0	0	3	2	0	0	0	5	16
West Virginia:											
Charleston	0	2	0	0	1	0	0	0	0	0	15
Huntington	0	------	--------	0	-------	2	0	-------	0	0	--------
Wheeling	0	------	0	1	2	2	0	0	0	0	19
North Carolina:											
Gastonia	0	------	--------	0	-------	0	0	-------	0	0	--------
Raleigh	0	------	0	0	1	0	0	0	0	0	13
Wilmington	1	------	0	0	3	0	0	0	0	0	18
Winston-Salem	0	1	0	0	1	3	0	0	0	0	12
South Carolina:											
Charleston	1	89	0	0	3	0	0	1	0	0	26
Florence	0	------	0	0	3	0	0	0	0	0	13
Greenville	0	------	0	0	0	1	0	0	0	1	2
Georgia:											
Atlanta	0	27	4	5	2	5	0	5	0	1	89
Brunswick	0	------	0	0	0	0	0	1	0	0	3
Savannah	0	28	1	1	4	1	0	2	0	0	32
Florida:											
Miami	0	11	0	1	1	3	0	1	0	0	44
Tampa	3	4	4	80	1	1	0	2	0	1	34
Kentucky:											
Ashland	0	------	0	2	2	0	0	0	0	0	6
Covington	0	------	0	0	4	3	0	2	0	0	16
Lexington	0	------	0	0	1	1	0	2	0	2	18
Louisville	0	33	1	2	12	20	0	3	0	26	73
Tennessee:											
Knoxville	1	3	2	0	3	13	0	1	0	0	33
Memphis	0	8	4	4	10	21	0	8	0	5	100
Nashville	0	------	1	7	6	2	0	0	0	8	51
Alabama:											
Birmingham	1	6	1	0	9	2	0	4	1	2	90
Mobile	0	17	3	1	1	1	0	0	0	0	28
Montgomery	2	4	--------	12	-------	4	0	-------	0	0	--------
Arkansas:											
Fort Smith	0	13	--------	0	-------	1	0	-------	0	0	--------
Little Rock	0	14	0	0	8	2	0	1	0	0	--------

City reports for week ended March 9, 1940—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								
Louisiana:											
Lake Charles	0	------	0	2	2	0	0	0	0	0	5
New Orleans	3	2	1	2	17	22	0	11	0	0	154
Shreveport	0	------	1	0	12	1	0	2	0	0	38
Oklahoma:											
Oklahoma City	0	6	0	0	8	2	0	4	0	0	50
Tulsa	1	------	-------	0	-------	2	0	-------	2	6	-------
Texas:											
Dallas	6	6	2	20	4	0	0	5	0	12	86
Fort Worth	0	------	0	0	5	1	0	0	0	16	43
Galveston	1	------	0	12	1	1	0	4	0	1	19
Houston	3	3	1	10	9	3	0	2	0	1	79
San Antonio	1	11	4	57	12	0	0	10	0	5	107
Montana:											
Billings	0	------	0	0	0	2	0	0	0	0	10
Great Falls	0	------	0	0	5	3	0	0	0	0	15
Helena	0	------	0	0	0	2	0	0	0	0	3
Missoula	0	1	0	0	0	0	0	0	0	1	4
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	7
Colorado:											
Colorado Springs	0	------	0	1	2	1	0	0	0	0	16
Denver	3	------	2	6	10	5	0	5	0	2	108
Pueblo	0	------	0	5	3	3	0	0	0	1	10
New Mexico:											
Albuquerque	0	------	0	0	1	0	0	3	0	0	10
Utah:											
Salt Lake City	0	------	0	94	1	6	0	1	0	46	34
Washington:											
Seattle	0	------	2	362	6	6	0	3	0	13	100
Spokane	0	------	0	0	3	3	0	1	0	5	28
Tacoma	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Oregon:											
Portland	1	3	0	201	2	4	0	1	0	13	84
Salem	0	------	-------	11	-------	0	0	-------	0	0	-------
California:											
Los Angeles	3	65	5	18	10	27	0	14	0	18	339
Sacramento	1	5	1	2	3	2	0	1	0	22	35
San Francisco	5	------	0	3	5	18	0	11	0	12	194

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				Michigan:			
Providence	1	1	0	Detroit	2	1	0
New York:				Wisconsin:			
Buffalo	0	1	0	Superior	0	0	1
New York	1	0	0	Alabama:			
Pennsylvania:				Birmingham	0	0	1
Philadelphia	1	0	0	Montgomery	0	0	1
Ohio:				Louisiana:			
Cincinnati	1	0	0	Shreveport	0	1	0
Illinois:				California:			
Chicago	1	0	0	Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Great Falls, 2; San Francisco, 1.
Pellagra.—Cases: Washington: 1; Savannah, 1; Miami, 1; Tampa, 1; Birmingham, 2; Los Angeles, 1.
Typhus fever.—Cases: Houston, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Weeks ended January 20 and 27, and February 3, 1940.—During the weeks ended January 20 and January 27, and February 3, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Week ended Jan. 20, 1940

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2	1		1			4
Chickenpox		15		194	392	33	46	20	45	745
Diphtheria			1	37	2	11	3	1		55
Influenza		72			48	1			30	151
Measles		1		87	328	77	12	5	11	521
Mumps				34	238	21	81		11	385
Pneumonia		11			24		5		6	46
Poliomyelitis						1				1
Scarlet fever	1	9	7	103	160	18	12	40	15	365
Tuberculosis	1	16	14	68	45	5				149
Typhoid and paratyphoid fever			1	12			1		5	19
Whooping cough		54		96	97	65	25	5	30	372

Week ended Jan. 27, 1940

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				6	1					7
Chickenpox		8	1	179	454	79	42	18	55	836
Diphtheria		1	2	28	3	18	4	1		57
Dysentery				1						1
Influenza		48			104	1			16	169
Lethargic encephalitis					1					1
Measles				131	494	109	57	3	36	830
Mumps				45	284	16	1	1	6	353
Pneumonia		6			31	1	1		4	43
Poliomyelitis					2					2
Scarlet fever		9	12	86	172	27	13	31	6	356
Trachoma					1				1	2
Tuberculosis		14	28	75	68	6	14			205
Typhoid and paratyphoid fever				10	2	1		1	2	16
Whooping cough		32	2	137	102	40	60	12	25	410

NOTE.—For the week ended Jan. 27, no cases of the above diseases were reported from Prince Edward Island.

Week ended Feb. 3, 1940

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		15		143	408	32	87	24	35	744
Diphtheria		1	2	21	1	14	7			46
Dysentery				1						1
Influenza		52			622	28			19	721
Measles				132	341	142	53	5	49	722
Mumps				54	320	16	48		5	443
Pneumonia		9			20	1	1		16	47
Poliomyelitis					1					1
Scarlet fever		13	6	140	190	15	10	23	11	408
Trachoma							2		2	4
Tuberculosis	1	23	20	58	54	5		1		162
Typhoid and paratyphoid fever				13	4		1	1		19
Whooping cough		27	43	167	83	15	38	11	7	391

INFLUENZA IN EUROPE

An epidemic of influenza, mild in character, occurred in Great Britain, Germany, and Switzerland during January and February 1940, while no abnormal rise in incidence was reported for Sweden, Norway, Denmark, or the Netherlands, according to the Weekly Epidemiological Record [1] issued by the Health Section of the League of Nations.

In Scotland the peak of the epidemic was apparently reached during the week of February 3. For the 4 weeks ended February 17, pneumonia deaths reported were, respectively, by weeks, 725, 823, 706, and 492, while the number of deaths from influenzal pneumonia were 120, 179, 159, and 139.

In 126 great towns of England and Wales the highest weekly death rate for the year up to February 17 occurred in the week of January 27, while the largest number of deaths from influenza was reported for the week ended February 17.

Influenza mortality in the great towns of England and Wales was higher during the first 7 weeks of 1940 than it was during the corresponding period of 1938 and 1939, but lower than in 1937.

During the first 4 weeks of the year the pneumonia deaths in 57 large towns of Germany (population 24,290,000), excluding Austria, were 500, 638, 695, and 782, while the influenza deaths were 80, 101, 138, and 122, respectively. The general death rate was, successively, 14.7, 15.4, 17.3, and 18.3 per 1,000.

In Switzerland, 2,058 cases of influenza were reported in 14 cantons (including 840 cases at Basel) for the week ended February 10 as compared with 1,347 cases in 13 cantons (712 at Basel) for the preceding week.

LATVIA

Notifiable diseases—October–December 1939.—During the months of October, November, and December 1939, cases of certain notifiable diseases were reported in Latvia as follows:

[1] February 29, 1940.

Disease	October	November	December	Disease	October	November	December
Anthrax	2			Paratyphoid fever	17	17	17
Botulism	2			Poliomyelitis	3	2	5
Cerebrospinal meningitis	5	5	2	Puerperal septicemia	6	8	5
Diphtheria	147	247	206	Scarlet fever	365	507	501
Dysentery		1		Tetanus	3	1	1
Erysipelas	55	58	42	Trachoma	69	84	82
Influenza	43	47	68	Tuberculosis (respiratory system)	148	175	200
Lead poisoning	2	5	1	Typhoid fever	37	43	34
Lethargic encephalitis			1	Typhus fever		1	
Measles	89	214	250	Whooping cough	27	32	52
Mumps	52	82	77				

SWITZERLAND

Communicable diseases—December 1939.—During the month of December 1939, cases of certain communicable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	12	Mumps	130
Chickenpox	189	Poliomyelitis	18
Diphtheria	42	Scarlet fever	405
German measles	11	Tuberculosis	164
Influenza	110	Typhoid fever	3
Malaria	1	Undulant fever	8
Measles	726	Whooping cough	258

WORLD DISTRIBUTION OF 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 tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		Jan. 1–Dec. 31, 1939	January 1940	February 1940—week ended— 3	10	17	24
ASIA							
Afghanistan	D	578					
Ceylon: Batticaloa	C	7					
China	C	2,705					
Canton	C	9					
Hong Kong	C	684					
Shanghai	C	427					
Tientsin	C	34					
India	C	123,170					
Bassein	C	14					
Calcutta	C	3,927	99	47	37	44	31
Madras	C	6	1				
Negapatam	C	2					
Rangoon	C	18	6	4	2	2	6
India (French)	C	92	1				
India (Portuguese)	C	17					
Indochina (French)	C	1				1	
Iran	C	435					
Iraq: Basra	C	[1] 1					
Japan: Osaka	C	[2] 1					
Thailand	C	25				[2] 3	49
Bangkok	C	7					

[1] Suspected.

[2] Imported.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		Jan. 1–Dec. 31, 1939	January 1940	February 1940—week ended— 3	10	17	24
AFRICA							
Algeria: Algiers	C	1					
Belgian Congo	C	58			2		1
British East Africa:							
Kenya	C	4					
Nyasaland	C	2					
Uganda	C	316	7				
Egypt: Asyut Province	C	102	19	5	28	21	26
Madagascar	C	620					
Rhodesia (Northern)	C						1
Senegal: Dakar.[1]							
Tunisia: Tunis	C	1					
Plague-infected rats		5					
Union of South Africa	C	80					
ASIA							
China:							
Fukien Province	D	[2] 753					
Manchuria	D	332					
Dutch East Indies:							
Java:							
Batavia	C	[3] 1					
Batavia Residency	D	[4] 84					
Java and Madura	C	1,549					
India	C	36,489					
Bassein	C	12					1
Calcutta	C	2					
Cochin	C	3				1	
Plague-infected rats		4	3				
Rangoon	C	[4] 8	[3] 1				
Indochina (French)	C	2					1
Thailand:							
Bangkok	C			1			2
Bichitr Province	C	4					
Bisnulok Province	C	35	2	1			
Dhonpuri Province	C			1			
Jayanad Province	C			3			
Kamphaeng Bajr Province	C		25	1	1	1	
Lampang Province	C	1					
Nagara Svarga Province	C		8	5		5	4
Prae Province	C	6					
Sukhodaya Province	C		12	2		1	
Svargalok Province	C	30					
Tak Province	C	10					
EUROPE							
Portugal: Azores Islands	C		2				
SOUTH AMERICA							
Argentina:							
Jujuy Province	C	1					
Mendoza Province	C	1					
Salta Province	C	1	1				
San Luis Province	C	1					
Tucuman Province	C	1					
Bolivia	C	32					
Brazil:							
Alagoas State	C	43					
Bahia State	C	1					
Parahiba State	C	1					
Pernambuco State	C	32					
Sao Paulo State	C	1					
Ecuador:							
Chimborazo Province	C	24					
Riobamba	C	[4] 16					
Guayaquil	C	3					
Plague-infected rats		45					
Loja	C	4					
Puebla Viejo	C	3					

[1] During the week ended Mar. 16, 1940, 1 death from plague (imported) was reported in Dakar, Senegal.
[2] Includes 94 deaths from pneumonic plague.
[3] Imported.
[4] Pneumonic.
[5] Includes 1 imported case.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		Jan. 1–Dec. 31, 1939	January 1940	February 1940—week ended— 8	10	17	24
SOUTH AMERICA—continued							
Peru:							
Ancash Department	C	1					
Cajamarca Department	C	10					
Lambayeque Department	C	12					
Libertad Department	C	36					
Lima Department	C	39					
Piura Department	C	35					
Venezuela [6]	C	3					
OCEANIA							
Hawaii Territory:							
Paauhau	C	[7] 1					
Plague-infected rats		54	2	1	1		2

SMALLPOX

AFRICA							
Algeria	C	6					
Angola	C	104					
Belgian Congo	C	1,651	198	136	90	93	
British East Africa	C	688	1				
Dahomey	C	68	16				
Eritrea	C	2					
French Equatorial Africa	C	45					
French Guinea	C	40					
Gold Coast	C	141					
Ivory Coast	C	370					
Morocco	C	10					
Mozambique	C	102					
Nigeria	C	4,620					
Niger Territory	C	134	137				
Portuguese East Africa	C	24					
Portuguese Guinea	C	122					
Rhodesia:							
Northern	C	34					
Southern	C	219	50				
Senegal	C	257	9				
Sierra Leone	C	51					
Sudan (Anglo-Egyptian)	C	552	75	2	20	5	1
Sudan (French)	C	27					
Union of South Africa	C	209					
ASIA							
Arabia	C	1					
Ceylon	C	1					
China	C	1,593	97	21	33		
Chosen	C	155					
India	C	111,230					
India (French)	C	59					
Indochina (French)	C	3,643	130				
Iran	C	87	12				
Iraq	C	91	17	3	3	33	1
Japan	C	229	3				
Straits Settlements	C	1					
Syria	C	1					
Thailand	C	155					
EUROPE							
France	C	4					
Great Britain	C	1	2				
Greece	C	69					
Portugal	C	950	29	4	4	4	1
Spain	C	747	52				
Canary Islands	C	3					
Turkey	C	428					
NORTH AMERICA							
Canada	C	160					
Guatemala	C	9	1				
Mexico	D	1,264		2			
Salvador	C	1					

[6] For the period Dec. 7, 1939, to Jan. 4, 1940, 11 cases of plague with 8 deaths were reported from the interior of Venezuela.

[7] Pneumonic plague; proved fatal.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths]

Place		Jan. 1–Dec. 31, 1939	January 1940	February 1940—week ended—			
				3	10	17	24
SOUTH AMERICA							
Argentina	C	3					
Bolivia	C	247					
Brazil	C	26					
Colombia	C	2,784	10				
Ecuador	C	8					
Uruguay	C	5					
Venezuela	C	109	18				

TYPHUS FEVER

AFRICA							
Algeria	C	1,883	99		[1] 97		
Belgian Congo	C		76	593	156	268	
British East Africa	C	2					
Egypt	C	4,239	180	53	87	104	
Eritrea	C	9					
Libya	C	37					
Morocco	C	901					
Nigeria	C	2					
Portuguese East Africa	C	2					
Southern Rhodesia	C	3					
Swaziland	C	1					
Tunisia	C	6,104					
Union of South Africa	C	1,091	6				
ASIA							
China	C	308	9				
Chosen	C	734					
India	C	17					
Iran	C	86	17				
Iraq	C	49		1	1		2
Palestine	C	198	7	4			
Straits Settlements	C	16					
Sumatra	C	1					
Syria	C	5					
Trans-Jordan	C	19	1	4	4	3	1
EUROPE							
Bulgaria	C	108					
Greece	C	45			1		
Hungary	C	57	12			1	
Irish Free State	C	5					
Latvia	C	3					
Lithuania	C	153					
Poland	C	8,140					
Portugal	C	27					
Rumania	C	942	247	82	82	60	95
Spain	C	62	2				
Turkey	C	471	66				
Yugoslavia	C	404	23				
NORTH AMERICA							
Cuba	C	4					
Guatemala	C	242	16				
Mexico	D	344	2		1		1
Panama Canal Zone	C	3					
SOUTH AMERICA							
Bolivia	C	162					
Chile	C	1,244	8		1		
Peru	C	197					
Venezuela	C	10	1				
OCEANIA							
Australia	C	26					
Hawaii Territory	C	36	1		2		1

[1] For 2 weeks.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		Jan. 1–Dec. 31, 1939	January 1940	February 1940—week ended—			
				3	10	17	24
AFRICA							
Cameroon:							
Bafia	C	1					
Nkongsamba	C		[1] 1				
French Equatorial Africa:							
Bangui	C	[1] 1					
Chad—Fort Lamy	C	1					
Fort Archambault	C		[1] 1				
Gabon	D	1					
Madingo Kayes.[2]							
French Guinea	C	2					
Gold Coast	C	2					
Ivory Coast	C	[3] 25	1				
Nigeria	C	[4] 11					
Niger Territory:							
Dosso	C	3					
Konni Circle	C	3					
Tahua	C	[1] 1					
Senegal:							
Bambey	C	1					
Dakar	C	[1] 1					
Diourbel	C	6					
Louga	C	[1] 1					
Ziguinchor	C	10					
Sudan (French): Bandiagara	C	1					
Togo (French): Anecho	C	1					
SOUTH AMERICA							
Brazil:							
Amazonas State	D	[5] 1					
Bahia State	D	[5] 1					
Espirito Santo State	D	[6] 104	[5] 28				
Minas Geraes State	D	13					
Para State	D	3					
Rio de Janeiro State	D	3	[5] 1				
Colombia:							
Antioquia Department—							
Caracoli	D	3					
Jordan	D	1					
San Carlos	D	6					
San Luis	D		1	1			
Caldas Department—							
La Pradera	D			1			
Victoria	D					1	

[1] Suspected.
[2] On Mar. 4, 1940, 1 fatal case of suspected yellow fever was reported in Madingo Kayes, French Equatorial Africa.
[3] Includes 8 suspected cases.
[4] Includes 3 suspected cases.
[5] Jungle type.
[6] Includes 8 deaths from the jungle type of yellow fever.