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NATIONAL INVENTORY OF NEEDS FOR SANITATION FACILITIES

IV. RURAL SANITATION

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INTRODUCTION

A safe water supply and a sanitary method of excreta disposal are essential for every place of habitation, whether it be in a city, village, or rural area. In cities and other urban areas, the density of population usually is such as to make the installation and maintenance of public water supply and sewerage systems economically feasible and these facilities are provided and maintained through organized community effort. Unfortunately this is not true in rural areas and, therefore, in lieu of these needs being met by community effort each householder has the responsibility of providing and maintaining complete water supply and excreta disposal facilities for his home. Thus the development of the necessary personal interest in and the incentive for better rural sanitation requires that primary emphasis be given to educational programs. A higher standard of rural housing, to include the sanitation facilities that may be provided by the individual for his home, will be secured only after he has developed an interest in providing for himself and his family the protection and comfort that can thus be afforded.

Educational programs are essential to create a realization by the rural householder that he has the responsibility for the provision and maintenance of a safe water supply and adequate sanitary facility for his home. Obviously this is a fundamental phase of any environmental sanitation program and should be utilized to the fullest extent in order to advance rural sanitation on a permanent basis. Regulations governing the construction and maintenance of rural sanitary facilities essential for the protection of the public health should be enforced in those instances where educational methods have failed.

Only a few States have adequate public health laws applicable to the control of excreta disposal in rural areas. Legislation governing the construction and maintenance of sanitary facilities where sewers are impracticable should be enacted by the remainder of the States.

This inventory of rural sanitation needs covers the water supply and sewerage facilities not included in Water Supply Needs in States and Sewerage and Water Pollution Abatement, Parts I and III, respectively, of the National Inventory of Needs for Sanitation Facilities. The inventory, Water Supply Needs in States, indicates that the existing public water supply facilities plus those that should be constructed would serve a total of about 86,300,000 persons in the United States. Likewise, the inventory, Sewerage and Water Pollution Abatement, shows that sewers are now available to or could be provided for a total of approximately 84,000,000 people. It is apparent, therefore, that approximately 50,000,000 people in this country, or more than one-third of the population, must be served by individual water and sewerage facilities. Thus the provision and maintenance of at least safe water supplies and sanitary methods of excreta disposal for this portion of the population is a problem of considerable magnitude.

Only the minimum types of water supply and sewerage facilities required to protect the health of the rural population are included in this inventory of rural sanitation needs. Consequently, no estimates are included as to the number of rural homes which have or might be provided with water under pressure and water-carriage systems of sewage disposal. These facilities are desirable but not essential from the public health standpoint because certain types of hand pumps and adequately protected wells supply safe water and properly constructed privies provide sanitary means of excreta disposal.

RURAL WATER SUPPLIES

Water is a necessity in the home for drinking, culinary, bathing, and laundry purposes. Therefore, the householder who is not served by a community water supply system must have a source of water from a well, cistern, spring, stream, or from his neighbor's supply. Convenience and aesthetic considerations were controlling factors in the selection of the source and type of water supply until it was discovered that typhoid fever and other enteric diseases resulted from drinking contaminated water. Public health workers then began consideration of methods to provide safe water supplies.

It is not practicable generally to provide water treatment facilities to serve the rural population. Therefore, the safety of the water supplied to rural homes is dependent upon the source of the water and the protection of the water from contamination at the source and

while in transit to the user. Consequently, the guidance of a qualified sanitary engineer in the selection of a source of water, the construction of the water supply facility, and its proper maintenance is essential.

Health organizations have done much to improve the quality of water supplied to rural homes through improvements in the design of wells and cisterns and the appurtenant equipment and in promoting their use in the rural areas. However, a greater appreciation of the essentiality of a safe water supply on the part of the rural people, further improvements in the design of wells, cisterns, and pumps, and closer supervision over their construction and operation are of importance in connection with efforts to improve the sanitary quality of water available to the rural population. Therefore, educational, research, and technical supervisory work by health agencies pertaining to rural water supplies is indicated.

The inventory of this phase of rural sanitation is based on information obtained from the National Inventory of Needs for Public Water Supplies, and the 1940 Census Reports on Housing Characteristics. Part I of the National Inventory of Needs for Sanitation Facilities indicates that about 84,500,000 persons in this country are now served by public water supplies and that it would be feasible to provide new water systems for approximately 1,800,000 additional people. This would leave an estimated 50,000,000 people or 12,000,000 homes to be served by private water supplies. Table 1, compiled from data of the 1940 Census reports on housing, shows that there are 1,530,097 rural homes without a water supply within 50 feet and that 5,018,279 rural homes have a water supply other than running water within 50 feet. This indicates that a total of approximately 6,550,000 rural homes in this country are not supplied with running water.

A water supply not within 50 feet of the home is not considered satisfactory because of its inconvenience to the householder and, therefore, it is assumed that a new supply should be provided. It is estimated that 75 percent of the wells, springs, and cisterns within 50 feet of the residence have sanitary defects such as improper construction, equipment, or maintenance which permit contamination of the water. On this basis, the 1,530,097 homes without a water supply within 50 feet and 75 percent of the remaining 5,018,279 homes without running water, or a total of approximately 5,294,000 rural homes, should have new or improved water supplies. The varying nature and extent of the necessary improvements to private water supplies and the wide range of cost due to local conditions in the construction of new supplies make it difficult to attempt the derivation of an average cost per home for the provision or improvement of these facilities. However, on the basis of the experience of the Farm Security Administration, it appears that $50 per home

might be considered reasonable. Applied to 5,294,000 homes the total estimated cost would be about $265,000,000 to provide safe water supplies necessary for the rural population.

RURAL SEWAGE DISPOSAL FACILITIES

A major phase of rural sanitation is the provision and maintenance of facilities for the disposal of human excreta in a sanitary manner. Wherever possible this should be accomplished through public sewerage systems. However, the majority of rural homes are so located that public sewers are impracticable and, therefore, the septic tank, privy, or other facility for excreta disposal must be utilized. In those instances where water-carriage systems of sewage disposal cannot be provided, privies properly constructed and maintained afford a sanitary means of excreta disposal.

The construction of sanitary privies as a public health measure to control hookworm disease was inaugurated in this country about the year 1910. The Rockefeller Sanitary Commission was established in 1909 for the purpose of combating hookworm disease. This Commission, the State boards of health, and the United States Public Health Service made sanitary and hookworm infestation surveys in 700 counties of 11 southern States and carried on control programs which consisted of treatment and the installation of sanitary privies. Concurrently, the United States Public Health Service conducted rural sanitation demonstration projects. The hookworm control programs and these projects during the period 1910 to 1920 demonstrated that sanitary privies were very effective in the control of intestinal diseases.

By 1920, the promotion of sanitary excreta disposal facilities in areas where sewers were impracticable was well recognized as an essential need by State and local health departments. Plans, specifications, and regulations governing the construction and maintenance of septic tanks and sanitary privies were developed. Sanitation personnel was assigned to conduct sanitary surveys and educational campaigns, enforce the sanitary laws where necessary, and to supervise the construction of septic tanks and privies. Several types of privies were developed, the most important of which were the box and can, concrete vault, and earth pit. The earth pit privy was found to be superior to the other types because it did not require scavenging. Thus, this type of privy was adopted by most State health departments. Rural sanitation work was continued without Federal assistance for labor or materials until the latter part of 1933.

In December 1933, the Civil Works Administration was inaugurated to relieve unemployment. With the inception of this program, the United States Public Health Service, recognizing the opportunity to

advance rural sanitation work, secured an allotment of CWA funds for the construction of sanitary privies. The Civil Works Administration furnished the necessary labor and the property owners provided the materials. The technical supervision of the community sanitation projects was rendered by the Public Health Service, State and local health departments. This program, although of short duration, demonstrated that the construction of sanitary privies was a desirable work relief project. Thus, similar community sanitartion projects were continued under the Federal Emergency Relief Administration and the Work Projects Administration. During the period from December 1933 through June 1942, 2,911,323, or roughly three million, sanitary privies were constructed in 38 States and in Puerto Rico through the cooperative efforts of the CWA, FERA, WPA, State health departments, and the United States Public Health Service.

Observations of privies constructed prior to the inception of the Federal Work Relief Program revealed that practically all of the pit privies had wood floors and risers which rapidly decayed and were difficult to keep clean. Recognizing the need for a more permanent type of construction, the Public Health Service developed a concrete slab and riser type of privy. The majority of State health departments either adopted the Service design or developed some type of concrete slab and riser earth pit privy. After some observations a number of States made this type of construction mandatory and about 90 percent of the privies constructed during the fiscal year 1939 under the Community Sanitation Program were of this type.

Considerable progress has been made in the provision of sanitary facilities for rural areas where sewers are impracticable. This phase of rural sanitation has been established as an important function of State and local health departments and in many instances the improvement of sanitary conditions in rural areas is included as a major component of their sanitation programs. The design of sanitary privies has been improved considerably and regulations have been adopted in some States governing the construction and maintenance of sanitary facilities in rural areas.

This inventory clearly indicates that there are a large number of rural homes in this country not served by adequate sanitary facilities. Part III of the National Inventory of Needs for Sanitation Facilities shows that 78,905,826 people in the United States are served by community sewers and that it would be practicable to provide new sewer systems for an additional 4,835,847 persons. On this basis, it appears that septic tanks, privies, or similar facilities must be utilized by approximately 52,000,000 people in about 12,000,000 homes in rural areas of this country.

Table 1, a tabulation of data from the 1940 Census Reports on Housing Characteristics, shows that there is a total of 12,971,360 rural homes in nonincorporated areas, of which 8,505,572 are served by outside toilets and 846,148 have no toilet facilities whatsoever. It is estimated that 50 percent of the existing privies are insanitary and should be replaced, and that the average cost of this work would be $35 per privy. Thus, it appears that the provision of privies for the 846,148 homes now without any sanitary facilities and replacing one-half of the privies now serving 8,505,572 homes, or the construction of a total of approximately 5,100,000 sanitary privies, is needed to provide minimum sanitation facilities for the rural population of the United States. On the basis of an average cost of $35 per privy, a rough estimate of the cost of this work is about $180,000,000.

METHODS OF COMPILING THE NATIONAL INVENTORY OF RURAL SANITATION NEEDS

Part I, "Public Water Supply Needs in States," and Part III, "Sewerage and Water Pollution Abatement," of the National Inventory of Needs for Sanitation Facilities include estimates of the additional public water supply and sewerage facilities needs for all incorporated places with 200 or more people. To avoid duplication, the "Inventory of Rural Sanitation Needs" includes only those homes in nonincorporated communities. This procedure does not include the sanitation needs of the incorporated communities with populations of less than 200 in the National Inventory. However, there are nonincorporated rural communities served by public water and sewerage systems or in which the installation of these facilities on a community basis would be practicable. Therefore, the inclusion of the rural sanitation needs for this group of communities in this inventory has been considered as compensating for the omission of the sanitation facilities needed in the incorporated communities with populations of less than 200.

The 1940 Census Reports on General Characteristics of Housing, Second Series, show the number of rural farm and nonfarm homes with (1) no running water supply within 50 feet; (2) no water supply within 50 feet; (3) outside toilet or privy; and (4) the number of homes with no toilet or privy. The number of rural farm homes in each of these categories included in table 1 was taken directly from the Census Reports. However, in these reports nonfarm dwelling units located outside urban places or in incorporated communities with populations less than 2,500 were classified as "rural nonfarm." Thus, to avoid duplicating the sanitation needs of Parts I and III of the National Inventory, the sanitation facilities needed for only those rural nonfarm homes outside of incorporated communities were included in this inventory. The number of rural nonfarm homes in

unincorporated areas was obtained from unpublished data compiled by the Bureau of the Census. The ratio by States of the rural nonfarm dwellings in unincorporated places to the total rural nonfarm homes was determined and applied to the total rural nonfarm dwellings included in the Census Reports under the above-mentioned items 1, 2, 3, and 4. The resulting values plus those for the rural farm homes which have been used as the basis for this inventory of rural sanitation needs are included in table 1.

TABLE 1.—*Showing by States the number of rural homes served by individual water supplies and outside toilets on basis of 1940 Census reports*

State	All rural dwelling units	Water supply other than running water within 50 feet	No water supply within 50 feet	Outside toilet or privy	No toilet or privy
Alabama	*432,393*	*248,573*	*102,519*	*300,763*	*89,284*
Rural nonfarm	121,318	43,252	23,169	81,211	10,722
Rural farm	311,075	205,321	79,350	219,552	78,562
Arizona	*87,985*	*8,643*	*23,872*	*41,523*	*14,129*
Rural nonfarm	55,822	5,172	7,587	26,469	3,016
Rural farm	32,163	3,471	16,285	15,054	11,113
Arkansas	*537,026*	*227,900*	*47,914*	*274,892*	*41,641*
Rural nonfarm	60,389	28,224	9,077	44,903	4,003
Rural farm	276,637	199,676	38,837	229,989	37,638
California	*608,142*	*29,690*	*17,132*	*174,118*	*9,217*
Rural nonfarm	415,528	15,171	10,365	92,645	6,160
Rural farm	192,614	14,519	6,767	81,473	3,057
Colorado	*127,669*	*43,210*	*20,245*	*93,296*	*8,881*
Rural nonfarm	52,011	9,245	6,071	30,319	1,190
Rural farm	75,658	33,965	14,174	62,977	2,691
Connecticut	*170,247*	*9,553*	*2,318*	*35,216*	*1,856*
Rural nonfarm	143,485	6,491	1,796	24,121	1,429
Rural farm	26,762	3,062	522	11,095	427
Delaware	*26,580*	*3,796*	*351*	*14,843*	*493*
Rural nonfarm	14,223	1,223	247	5,150	195
Rural farm	12,357	2,573	104	9,693	298
Florida	*202,395*	*68,466*	*23,883*	*121,700*	*13,648*
Rural nonfarm	123,651	31,601	12,361	64,098	5,519
Rural farm	78,744	36,865	11,522	57,602	8,123
Georgia	*425,259*	*273,300*	*62,945*	*329,043*	*47,594*
Rural nonfarm	104,240	42,335	11,083	66,344	5,669
Rural farm	321,019	230,965	51,862	262,699	41,925
Idaho	*77,796*	*21,248*	*10,575*	*55,784*	*2,509*
Rural nonfarm	23,870	3,275	2,227	13,417	757
Rural farm	53,926	17,973	8,348	42,367	1,752
Illinois	*589,410*	*187,552*	*15,972*	*292,961*	*8,798*
Rural nonfarm	129,652	45,016	5,969	77,585	2,204
Rural farm	259,758	142,316	10,003	215,376	6,594
Indiana	*349,883*	*160,851*	*13,504*	*267,984*	*7,461*
Rural nonfarm	127,416	42,824	5,596	80,284	2,325
Rural farm	222,467	118,027	7,908	187,700	5,136

TABLE 1.—*Showing by States the number of rural homes served by individual water supplies and outside toilets on basis of 1940 Census reports*—Continued

State	All rural dwelling units	Water supply other than running water within 50 feet	No water supply within 50 feet	Outside toilet or privy	No toilet or privy
Iowa	*262,383*	*122,671*	*23,823*	*204,711*	*7,010*
Rural nonfarm	25,641	7,447	1,194	13,136	538
Rural farm	236,741	115,224	22,634	191,575	6,472
Kansas	*215,876*	*103,972*	*20,218*	*171,969*	*6,321*
Rural nonfarm	41,109	10,373	2,053	23,000	793
Rural farm	174,767	93,599	18,165	148,969	5,528
Kentucky	*432,615*	*259,631*	*72,002*	*331,136*	*47,852*
Rural nonfarm	128,841	56,985	20,303	91,922	6,199
Rural farm	293,774	202,646	51,699	239,214	41,653
Louisiana	*310,498*	*187,939*	*36,231*	*249,687*	*21,561*
Rural nonfarm	105,721	42,472	10,243	73,373	4,118
Rural farm	204,777	145,467	25,988	176,254	17,443
Maine	*165,872*	*32,634*	*11,946*	*73,293*	*3,130*
Rural nonfarm	120,424	19,589	8,540	45,676	2,058
Rural farm	45,448	13,045	3,406	27,617	1,072
Maryland	*175,983*	*40,631*	*11,913*	*92,125*	*4,957*
Rural nonfarm	116,804	21,442	6,654	49,536	2,462
Rural farm	59,179	19,189	5,259	42,589	2,495
Massachusetts	*161,811*	*6,649*	*2,562*	*38,839*	*1,892*
Rural nonfarm	135,579	5,095	2,224	29,360	1,589
Rural farm	26,232	1,554	338	9,479	303
Michigan	*467,975*	*151,806*	*28,861*	*300,329*	*8,166*
Rural nonfarm	230,050	44,858	16,326	111,672	3,338
Rural farm	237,925	106,948	12,535	188,657	4,828
Minnesota	*271,529*	*107,768*	*58,906*	*220,346*	*7,740*
Rural nonfarm	52,949	13,278	6,396	29,651	1,276
Rural farm	218,580	94,490	46,510	190,695	6,464
Mississippi	*387,886*	*255,022*	*73,077*	*288,607*	*70,731*
Rural nonfarm	52,874	18,398	8,103	33,426	4,845
Rural farm	335,012	236,624	64,974	255,181	65,886
Missouri	*412,975*	*251,904*	*41,020*	*334,447*	*24,281*
Rural nonfarm	101,134	38,717	7,719	63,479	2,814
Rural farm	311,841	213,187	33,301	270,968	21,467
Montana	*87,241*	*26,250*	*22,083*	*66,565*	*2,980*
Rural nonfarm	33,320	5,629	6,036	20,124	756
Rural farm	53,921	20,621	16,047	46,441	2,224
Nebraska	*151,613*	*56,451*	*18,279*	*121,669*	*5,393*
Rural nonfarm	12,118	2,303	506	6,151	280
Rural farm	139,495	54,128	17,773	115,518	5,113
Nevada	*19,358*	*2,597*	*1,866*	*10,014*	*548*
Rural nonfarm	14,581	1,484	1,252	6,760	389
Rural farm	4,777	1,113	614	3,254	159
New Hampshire	*78,496*	*7,046*	*2,336*	*25,419*	*1,076*
Rural nonfarm	59,260	5,113	1,847	16,778	830
Rural farm	19,235	1,933	479	8,641	246
New Jersey	*187,713*	*11,162*	*2,881*	*55,379*	*1,918*
Rural nonfarm	151,687	7,456	2,217	37,427	1,334
Rural farm	36,026	3,606	664	17,952	584

TABLE 1.—*Showing by States the number of rural homes served by individual water supplies and outside toilets on basis of 1940 Census reports*—Continued

State	All rural dwelling units	Water supply other than running water within 50 feet	No water supply within 50 feet	Outside toilet or privy	No toilet or privy
New Mexico	*86,557*	*29,916*	*25,728*	*63,131*	*10,015*
Rural nonfarm	40,608	12,694	8,435	28,753	2,846
Rural farm	45,949	17,222	17,293	34,398	7,169
New York	*634,989*	*86,811*	*17,309*	*238,294*	*7,239*
Rural nonfarm	429,583	38,236	11,150	110,675	4,214
Rural farm	205,406	48,575	6,159	127,619	3,025
North Carolina	*507,370*	*251,598*	*75,184*	*348,183*	*84,969*
Rural nonfarm	160,223	52,956	18,911	95,857	10,487
Rural farm	347,147	198,642	56,273	252,326	74,482
North Dakota	*88,632*	*27,561*	*34,716*	*76,077*	*4,040*
Rural nonfarm	9,932	2,103	2,788	6,532	266
Rural farm	78,700	25,458	31,928	69,545	3,774
Ohio	*495,754*	*173,766*	*19,357*	*344,868*	*9,485*
Rural nonfarm	214,799	57,411	10,016	121,556	3,499
Rural farm	280,955	116,355	9,321	223,312	5,986
Oklahoma	*295,661*	*165,977*	*58,284*	*231,179*	*32,280*
Rural nonfarm	63,653	19,891	10,022	42,501	3,237
Rural farm	232,008	146,086	48,262	188,678	29,043
Oregon	*151,853*	*25,989*	*9,529*	*83,896*	*3,228*
Rural nonfarm	70,835	7,438	3,847	29,687	1,408
Rural farm	80,998	18,551	5,682	54,209	1,820
Pennsylvania	*695,390*	*138,434*	*27,321*	*403,001*	*10,154*
Rural nonfarm	475,149	70,988	18,546	240,464	6,131
Rural farm	220,241	67,446	8,775	162,537	4,023
Rhode Island	*22,326*	*2,721*	*359*	*8,193*	*368*
Rural nonfarm	19,407	2,029	311	6,638	320
Rural farm	2,919	692	48	1,555	48
South Carolina	*297,645*	*148,574*	*46,404*	*202,918*	*45,358*
Rural nonfarm	97,671	29,012	10,796	52,766	6,428
Rural farm	199,974	119,562	35,608	150,152	38,930
South Dakota	*92,828*	*35,558*	*24,140*	*78,855*	*4,182*
Rural nonfarm	11,452	2,610	1,838	7,015	340
Rural farm	81,376	32,948	22,302	71,840	3,842
Tennessee	*425,649*	*219,231*	*101,116*	*311,606*	*66,391*
Rural nonfarm	125,305	45,421	25,034	83,020	9,444
Rural farm	300,344	173,810	76,082	228,586	56,947
Texas	*827,195*	*354,734*	*142,023*	*627,473*	*54,655*
Rural nonfarm	251,532	60,139	27,936	150,243	7,800
Rural farm	575,663	294,595	114,087	477,230	46,855
Utah	*38,768*	*4,313*	*4,095*	*22,708*	*1,392*
Rural nonfarm	16,502	807	773	8,514	358
Rural farm	22,266	3,506	3,322	14,194	1,034
Vermont	*58,100*	*3,220*	*1,863*	*22,512*	*815*
Rural nonfarm	29,520	1,397	956	7,716	385
Rural farm	28,580	1,823	907	14,796	430
Virginia	*374,850*	*143,464*	*83,274*	*265,043*	*33,25*
Rural nonfarm	152,010	44,474	22,279	91,286	6,553
Rural farm	222,840	98,990	60,995	173,757	26,700

TABLE 1.—*Showing by States the number of rural homes served by individual water supplies and outside toilets on basis of 1940 Census reports*—Continued

State	All rural dwelling units	Water supply other than running water within 50 feet	No water supply within 50 feet	Outside toilet or privy	No toilet or privy
Washington	*223,981*	*34,822*	*15,606*	*111,228*	*4,909*
Rural nonfarm	121,452	12,163	6,662	46,742	2,441
Rural farm	102,529	22,659	8,944	64,486	2,468
West Virginia	*275,659*	*111,620*	*42,567*	*212,286*	*8,608*
Rural nlnfarm	159,746	44,702	24,066	110,336	3,369
Rural farm	115,913	66,918	18,501	101,950	5,239
Wisconsin	*350,776*	*143,385*	*30,056*	*243,187*	*7,336*
Rural nonfarm	115,692	32,911	8,386	61,715	1,984
Rural farm	215,084	110,474	21,670	181,472	5,352
Wyoming	*32,790*	*9,910*	*7,957*	*24,336*	*1,430*
Rural nonfarm	10,311	1,216	1,386	5,713	277
Rural farm	22,479	8,694	6,571	18,623	1,153
Totals	12,971,360	5,018,279	1,530,097	8,505,572	846,148

SUMMARY

The National Inventory of Rural Sanitation Needs may be summarized as follows:

1. Safe water supplies and sanitary methods of excreta disposal are essential for the protection of the public health and where more convenient facilities are impracticable. Properly constructed and equipped wells and sanitary privies should be provided as the minimum facilities for this purpose.

2. Public water and sewer systems are impracticable for approximately 50,000,000 people of this country and, therefore, these people must utilize private water supplies and excreta disposal facilities.

3. Considerable progress has been made in the provision of safe water supplies and sanitary facilities for the rural population. The recent Federal Work Relief programs made notable contributions in improving the sanitary environment of rural homes.

4. About 5,294,000 rural homes now need new or improved water supplies and 5,100,000 rural homes need sanitary privies. Included in these totals are 1,530,097 rural homes without a water supply within 50 feet and 846,148 homes without any toilet facilities.

5. These rural sanitation needs should be fulfilled through (1) intensive educational programs; (2) enactment and enforcement of adequate sanitary ordinances; (3) the full utilization of such local, State, and Federal funds as may be available for this type of work; and (4) the assignment of sufficient personnel to rural sanitation to carry on the necessary educational work and to supervise technically the construction and maintenance of water supplies and excreta disposal facilities.

PATHOLOGY OF EXPERIMENTAL POISONING IN CATS, RABBITS, AND RATS WITH 2, 2 BIS-PARACHLORPHENYL-1, 1, 1 TRICHLORETHANE[1]

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In the course of the experiments of Smith and Stohlman (*1*) on the toxicology of 1, 1, 1 trichlor-, 2, 2 diparachlorphenyl-ethane (DDT, gesarol), material from 5 cats, 41 rabbits, and 34 rats was submitted for histologic study. The purpose of this report is to summarize the pathologic findings in these animals.

In the cats pronounced tremors, spasticity, and terminal extensor rigidity were observed. Spinal cord was examined in cat 6 which died 5 days after a single 300 mg. per kg. dose and in cat 7 which died on the twelfth day after 11 daily doses of 50 mg. per kg. fed in meat, not all of which was consumed. The spinal cord in cat 6 presented partial tigrolysis of anterior horn cells with pericellular vacuolation. A fat stain was negative. In cat 7 anterior horn cells lacked Nissl bodies in their reticulated lightly basophil cytoplasm and pericellular and paranuclear vacuoles were present. The other cats received by ingestion the following doses: Cat 1A, 6 daily doses of 50 mg. per kg. over a 9-day period, died in 15 days; cat 3A, 4 daily doses of 90 mg. per kg. in 6 days, died in 10 days; cat 50, 1 gm. per kg., killed 7 hours later.

Some fine droplet fatty degeneration of liver cells was seen in all 5, confined to scattered cells and small in amount in the shortest times (cats 50 and 6), considerable in amount and more or less diffuse in distribution in the longer periods (cats 3A, 7, and 1A). A single focus of coagulation necrosis was seen in the liver of cat 3A. The spleen showed no significant changes. The kidneys presented the normal heavy fatty infiltration of the epithelium of the convoluted tubules in all, while in cat 7 alone there were foamy basophil to oxyphil exudate and hyaline and coarsely globular casts in the proximal convoluted tubules. Cat 6 showed some interstitial lymphocyte infiltration in the renal cortex. Probably none of these renal findings are significant. Focal pulmonary hemorrhages were noted in cat 50 (7 hours), pulmonary congestion and marked serous exudation in cat 6 (5 days).

Nine rats were given daily doses of about two-thirds the lethal dose by stomach tube; 4 were killed in 5 days; 5 in 9 days. The spleen presented slight to moderate pulp myelosis, perhaps somewhat less in the 9-day group than in the 5-day rats, and a variable amount of pulp hemosiderosis, none in 3 rats; slight in 2; moderate in 4. In rats 1 to 4 (5 days) renal convoluted tubules presented cloudy to radially striated, fat-free epithelium, and, in rats 2 and 3, contained

[1] From the Pathology Laboratory and the Division of Physiology, National Institute of Health.

some hyaline oxyphil casts. In rats 5, 6, 8, and 9 (9 days), the proximal convoluted tubules showed slight to moderate basal accumulation of fine fat droplets in their epithelium. Foamy oxyphil exudate to hyaline casts were noted in these tubules in rats 5, 6, 7, and 8. Distal convoluted tubules, glomeruli, and pyramids were normal. In the rats (1 to 4) killed in 5 days, the liver showed slight to fairly marked accumulation of fine fat droplets in the cytoplasm of liver cells. Often this fat was dissolved out when the Herxheimer acetone 70 percent alcohol sudan IV stain was used, but it was readily demonstrated with the 60 percent isopropanol technique (*2*). In rat 3 there was also slight centrolobular cytoplasmic oxyphilia of liver cells and a few mitotic figures were present. More pronounced changes were recorded in the rats (5 to 9) killed after 9 days. In 4 rats (5, 7, 8, 9) there were in the centrolobular areas numbers of huge foamy to clear cells with nuclei similar to those of surrounding liver cells. These cells were two to three times the diameter of ordinary liver cells. Their foamy cytoplasm contained little or no fat. Associated with this hydropic degeneration there were more or less midzonal and centrolobular fine fat droplet degeneration of liver cells of ordinary size, a variable grade of centrolobular congestion and atrophy of liver cell cords, and a centrolobular fibroblast proliferation varying from slight and interstitial to replacement and partial trabeculation of the parenchyma. In this new connective tissue were isolated hydropic, fatty, normal, and coagulated necrotic liver cells in varying proportions, as well as numbers of phagocytes laden with fine fat droplets. The acid-fast ceroid of the dietary cirrhosis of rats was entirely lacking. In rats 5 and 8 there were also partially organizing foci of coagulative necrosis. Here the liver cells were normal in size and arrangement, but strongly oxyphil and completely karyolytic. Definite trabeculae setting off a few nodules of surviving liver cells were present in these same 2 rats.

Three rats were killed 3½, 3¾, and 5¼ hours after ingestion of 5.0, 4.8, and 3.8 gm. per kg. Examination of the brain and spinal cord after immediate Orth fixation showed in the first rat swelling and vacuolation of some nerve cells, tigrolysis, and fine, slightly basophilic reticulation of the cytoplasm of others in the tegmentum pontis only. In the second rat swelling and vacuolation involved a greater proportion of nerve cells and appeared also in the reticular substance of the medulla, the pontile nuclei, the thalamus, and the anterior horns of the spinal cord. Changes were still more severe and more widespread in the third rat, but still chiefly in brain stem and spinal cord.

Other rats were fed DDT incorporated in their diets. Diet 146 contained 0.2 percent and was quite toxic. The last survivor was killed at 15 days and showed no significant lesions. Diet 158 contained 0.1 percent DDT and 0.2 percent cyclohexanone. This diet

was tolerated for over 3 months, but when 7 rats were killed at 94 to 98 days, all showed quite marked fine droplet fatty degeneration of the liver, generally more marked in the midzones but often extending also to the periportal and central areas of the lobules. Regularly there was also a centrolobular increase in cytoplasmic oxyphilia with decrease of the normal coarse basophilic granulation. In some rats this process went on to formation of hyaline oxyphil masses, either contiguous with the rest of the cytoplasm or separated as rounded masses lying in clear vacuoles. No significant lesions were noted in kidney, spleen, or adrenal.

Feeding 0.05 percent DDT with 25 percent casein and 5 percent yeast produced similar fatty and hyaline changes in the liver in 2 of 4 rats (D–164) and the same amount with a 5 percent casein, 5 percent yeast diet with cystine 0.5 percent (D–163) or without cystine (D–162) gave similar inconstant hyaline and fatty changes in liver cells in the two groups of 6 and 4 rats, respectively. The picture here was confused by the concurrent centrolobular fatty infiltration due to the low protein diet and shown also in the two control series D–160 (5 percent casein+5 percent yeast) and D–161 (same + 0.5 percent cystine). However, the hyaline alteration did not appear in these 8 control rats. Interestingly, the fine droplet fatty degeneration of renal proximal convoluted tubules seen in the subacute toxicity experiment and absent in the 0.1 percent DDT feeding experiments reappeared in 6 rats of these series, 2 in group D–164, 4 in group D–163.

In rabbits killed in less than 5 days there were moderate to fairly marked centrolobular fine fat droplet deposition in liver cells and a moderate to fairly marked splenic hemosiderosis. In the latter much of the iron was evident as a diffuse blue staining of cytoplasm of pulp phagocytes with acidulated ferrocyanide solution, but definite granular hemosiderin was usually present as well. In several of this group fine fat droplets appeared also in the epithelium of deep cortical tubules in the kidney, epithelium of these and the more superficial convoluted tubules was swollen and finely granular, and tubules contained a little foamy oxyphil exudate. Three of these rabbits (75, 83, 84) had been fed 700, 300, and 300 mg. DDT and were killed in 10 hours, 2 days, and 2 days, respectively. The other three (94, 95, 96) had a 5-percent solution in a petroleum solvent applied to their skin over a period of 3 days, with a total dosage of 550 mg., and were killed on the fourth day. Since this petroleum solvent (varsol) by itself produced severe injury to the skin, perhaps these findings on these 8 rabbits are to be discounted.

More severe hepatic lesions were seen in a group of 5 rabbits (98, 99, 100, 101, 102) fed 50 mg. per kg. in olive oil daily to totals of 0.9 to 1.3 gm. Rabbit 98 was killed at 27 days, the other 4 died in 29, 27, 20, and 20 days.

The spleens of these rabbits were congested. Hemosiderin was scanty or lacking. The lungs showed no lesions, the kidneys moderately swollen, finely granular epithelium in the convoluted tubules, with fatty degeneration in the deep tubules as before in rabbits 101 and 102 (20 days).

Regularly the livers of these rabbits presented a more or less marked centrolobular cytoplasmic oxyphilia and hyaline degeneration. The hyaline oxyphil areas were often surrounded by a peripheral basophilic rim of cytoplasm and not infrequently were separated from it by a clear vacuole surrounding the rounded hyaline mass. Some of the cells containing this hyaline material showed normal nuclei; in a few, nuclei were enlarged and deeply stained, and in some there was karyolysis. In the rabbit (98) which was killed there was, in addition, a slight fatty degeneration with small patches and scattered isolated cells laden with fine fat droplets. In the 4 that died there was a moderate to marked fatty degeneration, and more or less numerous midzonal areas of coagulation necrosis were present. In some of these areas capillaries were occluded by fragmenting leucocyte thrombi. Some foci showed extensive polymorphonuclear leucocyte invasion, others none. A few foci of necrosis were seen also in rabbit 98. In rabbit 100 slight epithelioid cell reaction was evident and calcification of a few necrotic liver cells was seen.

Hepatic lesions similar in extent and character to the foregoing were produced in another series of 13 rabbits given DDT suspended in gum acacia solution daily by mouth in doses of 250 (5 rabbits) or 500 mg. (8 rabbits) per kg. Survival periods varied from 5 to 13 days, total dosages from 1.0 to 4.5 gm. per kg. These rabbits were numbered 3, 4, 183, 185, 186, 187, 188, 189, 191, 192, 193, 194, and 195.

In some livers the picture of hyaline oxyphil globules with or without surrounding vacuoles in the liver cell cytoplasm was the dominant feature; in others an often confluent midzonal or centrolobular coagulation necrosis grading over to granulation tissue replacement was seen. Fatty changes were usually present, often more pronounced in the hepatic cells bordering necrotic or granulating areas, and otherwise in the lobule centers. Greatly swollen foamy fat-free liver cells occurred singly or in clumps in about half of the rabbits. In this series polymorphonuclear leucocyte invasion of necrotic areas was absent, indicating that it may have been due to a secondary complication in the previous lot. Necrosis and hyaline globule degeneration were present in some measure in all 13 rabbits, some grade of proliferative reaction in 12, going on to replacement in 10. Calcification of necrotic liver cells occurred in 1 rabbit that survived 13 days.

Spleens, lungs, and kidneys showed similar minor alterations to the previous series. Brain and spinal cord showed variable amounts of vacuolation around large neurons in which coarse tigroid granules were well preserved. Myelin of spinal cord and peripheral nerves showed no fatty changes and generally appeared normal. Skeletal muscle was normal in 4 rabbits, while in rabbit 188 it showed focal areas of hyaline degeneration, necrosis, interstitia hemorrhage, and surrounding fibroblast proliferation with slight lymphocyte infiltration. Adrenals contained large amounts of lipoid and chromaffin. The heart of rabbit 186 showed diffuse dusting of the muscle fibers with very fine fat droplets, while in 3 other rabbits it was normal.

Six rabbits were killed at 16 to 19 days after receiving total doses of 1.1 gm. per kg. over 12 to 15 days by application to the skin of 5 percent solutions in dimethylphthalate alone (150, 151, 152) or containing also 10 percent cyclohexanone (153, 154, 155). One rabbit in each group showed slight fatty changes in the liver, while spleen, lung, and kidney showed no lesions.

Eleven rabbits were exposed by wrapping closely with cloth impregnated with DDT the shaved skin of the entire trunk, 3 (162 to 164) for 45 days and 8 (165 to 172) for 26 to 30 days. These rabbits presented only traces of fatty degeneration of the liver, slight and dubious parenchymatous degeneration of the kidneys, and nothing remarkable in lung, adrenal, or spleen. All these 11 rabbits were killed. The amount of DDT in the wrappings varied from 2.48 to 2.785 gm.

SUMMARY AND DISCUSSION

In spite of the pronounced neurologic symptoms histologic alterations in the central nervous system have been relatively slight. Vacuolation around large nerve cells in cord and cerebral motor nuclei has been seen in cats, rats, and rabbits; tigrolysis and cell vacuolation in cats and rats.

The most striking pathologic alterations are seen in the liver. Here there is a hyaline degeneration similar to that described in poisoning by azo-benzene and some of its derivatives (*3*). Hyaline oxyphil masses are formed in the central part of the cytoplasm and then are surrounded by vacuoles. This change has been seen in rats and rabbits. Also a variable amount of fatty degeneration of liver cells, often centrolobular, is observed in cats, rats, and rabbits. Midzonal and centrolobular areas of coagulation necrosis are found in cats, rats, rabbits, which in rats and rabbits is accompanied by an interstitial and peripheral proliferative reaction leading to replacement by a new vascular granulation tissue. With more extensive and confluent necrosis this replacement process leads to trabeculation. Finally there is seen also a focal hydropic degeneration of liver cells in

rats and rabbits in which the affected cells may reach two to three times their normal diameter. Nelson (*4*) reports lesions similar to these in his rabbits, rats, and guinea pigs.

Muscle necrosis with proliferative reaction was seen in one of our rabbits, and has been noted also by Nelson in this species and in guinea pigs. He has noted also necroses of heart muscle in occasional rabbits and guinea pigs.

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THE PHARMACOLOGIC ACTION OF 2,2 BIS(P-CHLOROPHENYL) 1,1,1 TRICHLORETHANE AND ITS ESTIMATION IN THE TISSUES AND BODY FLUIDS[1]

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The compound 2,2 bis(p-chlorophenyl) 1,1,1 trichlorethane, to be referred to as DDT, was first synthesized by Zeidler in 1874 (*1*). Pharmacologically it attracted little attention until recently when entomological investigations revealed insecticidal properties of extraordinary efficacy. The toxicity of this compound, its cumulative action, and its absorbability through the skin under a variety of conditions of external application have made it desirable to devise a method for its identification in the tissues and body fluids. The symptoms which this compound produces in experimental animals strongly resemble in some respects the action of phenol. Except for the delayed onset, which may be several hours, and persistence of action, which may last for one to several days, the hyperexcitability, the generalized fine and coarse tremors, culminating in flaccid or spastic paralysis with occasional tonic and clonic convulsions preceding death by respiratory paralysis, suggested the possibility of phenol or phenol-like substances being formed in the body in the course of systemic poisoning. However, examination of the blood and tissues of rats during various phases of DDT poisoning by a

[1] From the Division of Physiology, National Institute of Health.

method previously described (*2*) failed to show significant amounts of either free or conjugated phenols. Since the DDT molecule contains 5 atoms of chlorine, 50 percent of the molecular weight of the substance, it was decided to attempt its estimation as organic chlorine. Zeidler (*1*), who first described the chemical properties of this compound, stated that hydrolysis in alcoholic KOH split off one chlorine atom thereby desaturating the aliphatic carbon bond. This was readily confirmed. Attempts at more drastic hydrolysis at higher temperatures and for longer periods failed to yield appreciably more than the theoretical 20 percent of the available chlorine. The method of oxidation with fuming H_2SO_4 described by Willard and Thompson (*3*) was tried, but this presented so many difficulties when applied to biological material that it had to be abandoned. Attention was then directed to the decomposition of the compound by reduction with metallic sodium in absolute alcohol as first described by Stepanow (*4*) and later confirmed by Bacon (*5*). This procedure when applied to the pure substance gave uniformly good results, yielding practically all the available chlorine as NaCl with great ease, and later when applied to biological material appeared to give satisfactory results.

ESTIMATION OF THE PURE SUBSTANCE

A definite amount of the substance, 10 to 20 mg., in acetone solution in which it is readily soluble, is pipetted into a 100-cc. round-bottom flask of an all glass condenser, the acetone removed by gentle heating on the water bath, and the residue dissolved in 10 cc. absolute alcohol by warming. The substance is sparingly soluble in cold alcohol but readily soluble in hot alcohol. The flask is connected with the reflux condenser, 1 gm. metallic sodium cut up in small bits is gradually added through the condenser, and in 5 to 10 minutes, when the reaction is over, the flask is lowered into a boiling water bath and the mixture is refluxed for half an hour. The contents of the flask are then transferred, with the aid of water to an Erlenmeyer flask, acidified with 3 cc. concentrated HNO_3, decolorized for a few minutes with 1 gm. of chlorine-free Nuchar,[2] filtered and washed quantitatively, and the filtrate titrated for chlorine by the Volhard method using M/35.46 $AgNO_3$ in 10 percent HNO_3 and M/35.46 NH_4SCN with ammonium ferric sulfate as indicator. The results of eight analyses of the pure material recrystallized from absolute alcohol giving an average of 48.4 percent chlorine are shown in table 1 and indicate fairly good agreement with the theoretical value of 50 percent. Two different samples were used in the course of this work, and it is possible that they were not of the same degree of purity.

[2] Nuchar W, Merck and Co., washed with dilute HNO_3 until chlorine-free and air dried.

TABLE 1.—*Estimation of chlorine in DDT by reduction with metallic sodium*

Experiment number	DDT used (mg.)	Chlorine found (mg.)	Percent chlorine [1]	Experiment number	DDT used (mg.)	Chlorine found (mg.)	Percent chlorine [1]
1	10	4.9	49.0	5	10	4.8	48.0
2	10	5.1	51.0	6	15	7.2	48.0
3	15	7.3	49.3	7	10	4.7	47.0
4	10	4.8	48.0	8	10	4.7	47.0

[1] The results of the first 3 experiments were obtained with a sample recrystallized in April 1943 and air dried; the results of the last 5 experiments were obtained with another sample recrystallized in February 1944, and dried in vacuum desiccator over $CaCl_2$ for 2 days.

APPLICATION OF THE METHOD TO BIOLOGICAL MATERIAL

The ready solubility of the compound in ether and acetone suggested the possibility of recovering it from dried powdered tissues by Soxhlet extraction with either one of these solvents. In order to facilitate extraction the tissues were first dehydrated by maceration with anhydrous Na_2SO_4 (chlorine-free) to granular consistency, then dried at 90° C. for about 2 hours and ground to fine powder in an agate mortar. After Soxhlet extraction for several hours with either ether or acetone the solvent was removed on the water bath under a current of air, the dry residue taken up in 20 cc. hot absolute alcohol, filtered or centrifuged to remove any insoluble material if present, and the clear alcoholic solution divided into two equal parts; the one for direct titration of any inorganic chloride and the other for similar titration after reduction with metallic sodium as for the pure substance. With this procedure normal rabbit tissues such as blood, liver, kidney, and central nervous system showed no evidence of chlorine either before or after reduction with metallic sodium. Normal tissues with DDT added in amounts of from 10 to 20 mg. per 10 to 20 gm. of tissue and treated in this manner showed no chlorine on direct titration and the presence of chlorine after reduction with sodium, but the recoveries were irregular and usually low with a range of from 27 to 92 percent of that added. The failure to recover the substance more adequately seemed to be due to the mechanical difficulty of extracting the substance from the dried material which could not be reduced to a powder of a sufficient degree of fineness. It was then decided to attempt the extraction of the fresh tissue with acetone, after thoroughly macerating and dehydrating with Na_2SO_4 but without further drying. The acetone solution was filtered off, evaporated on the water bath under a current of air, and the process continued as previously described. With this procedure the recoveries of added DDT to normal tissues were good and uniform provided allowance was made for a small but variable amount of inorganic chlorine usually present in such extracts. That this indeed was only inorganic chlorine was demonstrated by the fact that acetone extracts of normal tissues with no DDT added gave identical values on titration after reduction

with sodium as without such reduction. The procedure of acetone extraction of fresh tissues dehydrated to granular consistency with anhydrous Na_2SO_4 was therefore adopted. After further experimentation it was found that the small amount of chlorine in the acetone extracts on direct titration can be reduced to a negligible minimum by redissolving the residue of the evaporated acetone extract in 2 to 3 portions of 5 to 10 cc. fresh acetone and filtering or centrifuging off the insoluble material before finally taking up the dried residue in hot absolute alcohol for reduction.

Table 2 shows the analytical results of experiments on normal rabbit tissues and excreta without and with the addition of DDT and the percentage recoveries in the latter instance.

TABLE 2.—*Estimation of DDT in rabbit tissues and excreta by the acetone extraction method and differential titration for chlorine. T=trace*

A. NO DDT ADDED

Number	Tissue	Gm. or cc.	Anhydrous Na_2SO_4 used (gm.)	Acetone used (cc.)	Mg. chlorine found in each half of extract		Percent DDT recovered
					Direct titration	After reduction	
1	Blood	20	120	200	1.1	1.1	0
2	Blood	20	120	200	[1] T	0	0
3	Liver	16	80	150	0.7	0.6	0
4	Liver	20	100	200	[1] T	T	0
5	Kidney	16	80	160	1.4	1.5	0
6	Kidney	12	50	75	1.3	1.3	0
7	Kidney	12	60	135	[1] T	T	0
8	C. N. S.	12	50	75	1.5	1.5	0
9	C. N. S.	13	65	145	[1] 0.1	0.1	0
10	C. N. S.	17	85	170	[1] T	T	0
11	Bile	1.2	10	50	0.0	0.0	0
12	Bile	0.5	10	100	----------	0.0	0
13	Feces	10	50	100	0.0	0.0	0

B. 20 MG. DDT ADDED

1	Blood	20	120	150	1.6	6.7	102
2	Blood	20	120	200	1.4	6.0	92
3	Blood	20	120	275	[1] 0.0	3.8	76
4	Liver	17	100	200	0.4	5.3	98
5	Liver	20	100	270	[1] T	4.2	84
6	Kidney	16	100	200	1.3	5.9	92
7	Kidney	14	70	190	[1] 0.0	4.4	88
8	C. N. S.	14	80	200	0.2	4.9	94
9	C. N. S.	14	70	190	[1] 0.0	4.5	90
10	Feces	10	50	100	0.0	4.4	88
11	Bile	2	20	100	0.0	5.0	100

[1] Residues of evaporated acetone extracts redissolved in fresh acetone and insoluble material removed by filtration.

The estimation of DDT in rabbit bile or feces is carried out in the same manner except that the direct chlorine estimation in the extract may be omitted, since upon analysis of several samples of bile and feces from normal rabbits no chlorine was found in the acetone extracts prepared as described either before or after reduction with sodium, while the recovery of added DDT was nearly quantitative.

The estimation of DDT in urine is best carried out by shaking out the acidified urine in a separatory funnel three to four times with half volume of ether. Acidification of the urine with acetic acid to a pH of about 4 gives as good results as with the use of stronger acids such as H_2SO_4 added up to 5 percent. The ether extract is washed with water until the washings are free of chlorine. With some urines heavy emulsions form. This is best dealt with by adding sufficient anhydrous sodium sulfate to the ether-emulsion mixture in a beaker to complete dehydration, and the ether extract and washings are shaken out in a separatory funnel once or twice with water until chlorine-free. The ether is evaporated, the residue taken up in absolute alcohol, reduced with sodium, and titrated as previously described. Added DDT to normal urine has been recovered by this process to the extent of from 84 to 90 percent. Ether extraction of alkaline urine has given poorer results, and extraction of acidified urine with petroleum ether or toluol has not proved satisfactory. Table 3 gives the results obtained with recoveries of added DDT to normal rabbit urine, and one human urine. In all cases the urines were acidified with acetic acid.

TABLE 3.—*Recovery of added DDT to normal rabbit urine by ether extraction*

Number	Urine (cc.)	DDT added (mg.)	Mg. chlorine found in each half of extract		Percent DDT recovered
			Direct titration	After reduction	
1	60	20	0	4.3	86
2	75	10	0	2.1	84
3	45	20	0	4.3	86
4	45	16	0	3.6	90
5	[1]100	20	0	4.2	84

[1] Human urine.

TOXICITY OF DDT

Because of the insolubility of this substance in water it has been necessary to administer the compound in solution in olive oil or in aqueous suspension with gum acacia. Gastro-intestinal absorption when given in aqueous suspension is irregular and poor, consequently the toxicity of the substance when given in this manner is much lower than when given in olive oil. The LD^{50} in rats when given intragastrically in 1 to 5 percent solution in olive oil is 150 mg. per kg.; in rabbits 300 mg. per kg. Death may often be delayed for several days. It may be of interest to compare the toxicity of this compound with that of phenol, similarly administered, it being more than three times as toxic as phenol in rats and possibly twice as toxic in rabbits. The symptoms, consisting of hyperexcitability, generalized fine and coarse tremors, spasticity progressing to flaccid

type of paresis of the extremities, do not come on for several hours. When developed the symptoms persist in rabbits and rats for a day or two and in cats usually for several days until recovery or death ensues. In cats a condition of persistent extensor rigidity with opisthotonos with fine and coarse muscular twitchings, especially of the muscles of the head and neck, has been observed to last for several days following a single oral dose of 300 mg. per kg. Two cats, receiving 100 and 200 mg. per kg., respectively, survived.

In table 4 are summarized the data on the acute toxicity of DDT in rats, rabbits, and cats.

TABLE 4—*Acute toxicity of DDT in rats, rabbits, and cats—oral administration in olive oil*

Number of animals	Weights	Dose (mg. per kg.)	Symptoms	Percent mortality
RATS				
6	100–190	50	Hyperexcitability and mild tremors	0
6	125–150	100	Tremors	0
28	200–300	150	Severe tremors	50
17	200–290	200	Tremors and paralysis	60
RABBITS				
5	2.0–2.1	50	Hyperexcitability	0
6	1.5–2.3	100	Hyperexcitability	0
3	1.8–2.5	159	Tremors	33
4	2.5–2.6	200	Tremors	25
8	1.3–2.1	300	Tremors and paralysis	50
CATS				
1	2.5	100	No effects	Survived
2	2.7	200	Tremors, spasticity, and dyspnea	One died
8	1.7–3.1	300	Tremors, spasticity, paralysis, tonic and clonic convulsions 2 to 5 days.	62

The effects of DDT in experimental animals are cumulative, and small single doses given repeatedly lead to chronic poisoning. In a group of 10 rats of about 80 gm. weight, DDT fed at a level of 0.1 percent in a semisynthetic adequate diet containing 18 percent protein as casein was uniformly fatal in from 18 to 80 days. Generalized tremors were present throughout. When fed at a level of 0.05 percent the animals survived 3 months, though there was some impairment of growth. Mild symptoms of hyperexcitability and some tremors were usually present.

In rabbits the daily oral administration of 50 mg. per kg. in olive oil, a dose which by itself produces only slight or no demonstrable effects, resulted in cumulative effects terminating in death in from 15 to 23 days after a total dose of from 0.75 to 1.25 gm. per kg. had been given. Under these conditions of administration the central nervous system effects were less pronounced, while parenchymatous degenera-

tion of the liver was the most pronounced finding. Hyaline centrolobular and midzonal degeneration with a variable amount of coagulation necrosis was a uniform finding. A more detailed discussion of the microscopic pathology of acute and chronic DDT poisoning is given in a separate publication (*6*). The results of the study on chronic toxicity in rabbits are summarized in table 5. Attention may be directed to the mild degree of anemia as evidenced by a reduction of the hemoglobin level. White blood cell counts failed to indicate significant deviations from the normal. In like manner two cats receiving 50 mg. per kg. every day or every second or third day developed all the characteristic symptoms of poisoning and died, one within 12 days after a total dose of 500 mg. per kg. and the other within 15 days after a total dose of 300 mg. per kg. A third cat having received 4 doses of 90 mg. per kg. within 10 days died with all the typical symptoms of tromors, ataxia, spasticity, paralysis, and terminal extensor rigidity.

TABLE 5.—*Chronic toxicity and cumulative action of DDT in rabbits when administered orally daily in doses of 50 mg. per kg. in olive oil*

Rabbit number	Weight (kg.)	Hemoglobin (gm.)		Number of doses given	Total fatal dose (gm. per kg.)	Necropsy findings
		Initial	Final			
98	1.8	14.2	11.2	23	1.15	Coagulation necrosis and hyaline degeneration of the liver.
99	2.0	13.2	10.6	25	1.25	Do.
100	1.7	11.1	11.0	23	1.15	Cogulation necrosis of the liver.
101	1.8	13.1	----	18	.90	Liver necrosis.
102	1.6	12.9	10.8	18	.90	Do.
103	2.0	13.0	----	15	.75	Do.

ABSORPTION OF DDT FROM THE SKIN

These experiments were carried out upon rabbits and the applications were made either in solution in dimethylphthalate over the shaved skin of the anterior abdominal surface or by snugly applying cloths, impregnated with DDT in acetone solution and air-dried, around the shaved skin of the body corresponding to an area of from the upper thoracic to the lower lumbar vertebrae. The solvent dimethylphthalate is nonirritant, as far as could be determined nonabsorbable through the skin, and of rather low toxicity when given orally to rabbits.[3] The results of this experiment showed that the application to the skin of DDT in dimethylphthalate solution is definitely toxic while the absorption of DDT from the skin when exposed to the material impregnated in cloths is slight. Some evidence of absorption has been obtained even under these conditions. The results of these tests are shown in tables 6 and 7. The symptomatology and the abnormal retention of intravenously injected rose

[3] The MLD in rabbits is 3.0 cc. per kg., in rats 7.5 cc. per kg.

bengal leave no doubt of the deleterious effect of the DDT applied in dimethylphthalate solution on the central nervous system and the liver. The possibility of ingestion of the drug was ruled out by the application of this solution four times daily, only during a period of some 6 to 7 hours, while the animal was immobilized on its back, and at the end of the daily applications the material was carefully swabbed off with cotton wool moistened with acetone and alcohol. The only evidence of skin adsorption of DDT from impregnated cloths is the systemic effects on the central nervous system seen in about half of the animals.

TABLE 6.—*Evidence of skin absorption of DDT applied to the skin of rabbits as 5 percent solution in dimethylphthalate. Series A, no cyclohexanone, Series B, 10 percent cyclohexanone added*

Number	Weight (kg.)		Daily topical applications		Days	Symptoms	Plasma rose bengal mg. percent at 30 minutes [1]
	Initial	Final	Cc. per kg.	Mg. DDT per kg.			
SERIES A							
150	1.6	1.4	2.0	100	12	Hyperexcitability, spasticity, and paralysis.	1.0
151	1.8	1.4	2.0	100	12	Generalized paresis	.9
152	1.7	1.4	2.0	100	13	Tremors and hyperexcitability	1.0
SERIES B							
153	2.0	1.8	2.0	100	14	Hyperexcitability	1.2
154	1.6	1.4	2.0	100	14	Tremors and spasticity	.4
155	1.6	1.6	2.0	100	15	None	.6

[1] Normally 0.3 to 0.6 mg. percent with an average of 0.4 mg. percent (7).

TABLE 7.—*Skin absorption of DDT applied to rabbits in impregnated cloths over a period of 26 to 30 days*

Rabbit number	DDT (am)	Weight (kg.)		Hemoglobin (gm. per 100 cc.)		Symptoms	Plasma rose bengal mg. percent at 30 minutes [1]
		Initial	Final	Initial	Final		
165	2.78	1.7	2.3	16.8	16.5	None	0.4
166	2.55	1.6	2.0	14.8	14.2	Tremors	.7
167	2.63	1.7	1.9	15.3	16.8	Hyperexcitability	.5
168	2.69	1.8	2.2	14.8	14.8	Tremors	.7
169	2.63	1.7	1.6	13.0	16.8	Hyperexcitability	.5
170	2.66	1.6	1.8	12.5	14.9	None	.9
171	2.62	1.5	1.7	15.0	17.6	None	.6
172	2.70	1.8	2.2	15.0	14.2	None	.4

[1] Normally 0.3 to 0.6, average 0.4 mg. percent (7).

INFLUENCE OF CYCLOHEXANONE ON THE TOXICITY OF DDT

Cyclohexanone, on account of its solvent and other properties, has been suggested for use in combination with DDT under certain conditions. Cyclohexanone is a narcotic by contrast with DDT, which is a convulsant. The acute toxicity of cyclohexanone in rats is about

2 gm. per kg., hence about one-tenth as toxic as DDT.[4] Combinations of the two administered to rats to ascertain the mutual effects upon each other have shown that two to six times as much of cyclohexanone may be given with DDT without adversely affecting the acute toxicity of the latter. Indeed, cyclohexanone appeared to afford some degree of antagonism to DDT, and it seems possible that narcotics in general may exhibit a similar antagonism. The application to the skin of rabbits of 5 percent DDT in dimethylphthalate with 10 percent cyclohexanone showed no greater toxicity than the DDT alone (series B, table 6). In a series of experiments on chronic toxicity in rats in which 0.2 percent cyclohexanone was fed with 0.1 percent DDT, all the animals survived a period of 90 days. It will be recalled that 0.1 percent DDT alone under the same experimental conditions showed a high rate of mortality, deaths occurring as early as the eighteenth day of the experiment.

DISTRIBUTION OF DDT IN TISSUE AND BODY FLUIDS

This work is in progress, and only one typical experiment is given to show the applicability of the method here described. A rabbit, No. 199, weighing 1.8 kg., was given orally 0.55 gm. DDT per kg. in olive oil. Severe generalized tremors and paralysis developed and continued for 2 days. At this time the animal was killed by exsanguination from the carotid artery. Samples of blood, liver, kidney, and central nervous system were taken for analysis by the acetone extraction method of the dehydrated tissues as described. The bile, 1.5 cc., obtained at necropsy was worked up in the same manner, and 100 cc. of bladder urine was extracted with ether as described. Chlorine determinations made by difference of that after reduction with sodium minus that obtained by direct titration gave the following values calculated as DDT per 100 gm. or cc.:

Blood	10.7 mg.
Liver	6.3 mg.
Kidney	3.9 mg.
Brain and cord	16.0 mg.
Bile	80.0 mg.
Urine	16.8 mg.

These values may be 10 to 20 percent low since the recoveries of added DDT have usually been around 80 to 90 percent.

DISCUSSION

The toxicity of DDT combined with its cumulative action and absorbability from the skin places a definite health hazard upon its

[4] In rabbits the MLD for cyclohexanone given orally is stated to be between 1.6 and 1.9 gm. per kg. (8).

use. Symptomatically the effects on the central nervous system are the most obvious, damage to the liver is less obvious and for this reason perhaps more serious. Knowledge of the mode of action of this substance in the body, its distribution, elimination, and detoxification will be helpful in guarding against accidental poisoning. Adequate means of detecting incipient poisoning are needed. The test we have described for estimating DDT in biological material based on its chlorine content assumes the compound to be in its original and unchanged form. For this there is no proof at present, and it is not at all impossible that it does undergo some degradation in the body. Until more information on its metabolic fate in the body becomes available, such an assumption is permissible, and it is believed the test should serve a useful purpose.

SUMMARY

The acute and chronic toxicity, the cumulative action and absorbability from the skin of 2,2 bis (p-chlorophenyl) 1,1,1 trichlorethane (DDT) in experimental animals are described. A method is suggested which appears suitable for the estimation of DDT in the tissues, body fluids, and excreta. The method is based on the extraction of the substance by suitable solvents and the determination of the organically bound chlorine after reduction with metallic sodium in absolute alcohol. With this method DDT has been found in the urine, bile, blood, liver, kidney, and central nervous system in experimental poisoning with the substance.

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PREVALENCE OF DISEASE

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

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 22, 1944

Summary

A total of 568 cases of poliomyelitis was reported, as compared with 462 last week, 137 for the 5-year (1939–43) median, and 329 for the week last year, which was the largest number recorded for a corresponding week of the past 17 years. Of the current total, an aggregate of 402 cases, or 70 percent, was reported in 6 States, as follows (last week's figures in parentheses): New York, 153 (93); Pennsylvania, 56 (31); Michigan, 24 (10); Virginia, 30 (39); North Carolina, 62 (63); and Kentucky, 77 (66). Ohio reported 14 cases, Illinois 13, California 11, and Indiana and Maryland 10 each.

For the country as a whole, 1,542 cases have been reported since June 24, as compared with 1,162 in 1934, the largest number previously recorded for a corresponding 4-week period, and 1,061 and 1,013, respectively, last year and in 1937. Exclusive of the 3 years mentioned, the average number of cases reported for the corresponding 4-week periods of the past 17 years was 388. The total to date this year is 2,324, as compared with 1,955 for the same period last year and a 5-year median of 1,148.

A decrease was recorded in the incidence of meningococcus meningitis. A total of 186 cases was reported, as compared with 205 last week, 188 for the next earlier week, 237 for the same week last year, and a 5-year median of 34. States reporting the largest numbers are New York, 34; California, 11; Massachusetts, New Jersey, and Pennsylvania, 10 each; and North Carolina and Texas 8 each. The cumulative total to date is 12,418, as compared with 12,779 last year and a 5-year median of 1,302.

Of a total of 184 cases of typhoid fever, as compared with 148 last week and 308 for the 5-year median, 21 were reported in Texas, 15 in Louisiana, 14 in Georgia, 12 in North Carolina, and 11 each in South Carolina and Kentucky. The cumulative total is 2,585, as compared with 2,424 for the period last year and a 5-year median of 3,277.

Of a total of 25 cases of Rocky Mountain spotted fever, as compared with 35 for the week last year, 16 occurred in the South Atlantic area, 1 in New York, and 8 in the central areas.

Deaths recorded in 93 large cities of the United States totaled 7,783 for the current week, as compared with 8,845 last week and a 3-year (1941–43) average of 8,188. The cumulative total is 271,912, as compared with 278,240 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended July 22, 1944, and comparison with corresponding week of 1943, and 5-year median

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

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1939–1943	Week ended—		Median 1939–1943	Week ended—		Median 1939–1943	Week ended—		Median 1939–1943
	July 22, 1944	July 24, 1943		July 22, 1944	July 24, 1943		July 22, 1944	July 24, 1943		July 22, 1944	July 24, 1943	
NEW ENGLAND												
Maine	1	0	0	------	------	------	10	43	43	1	0	0
New Hampshire	0	0	0	------	------	------	5	5	2	0	1	0
Vermont	0	0	0	------	------	------	7	65	29	0	1	0
Massachusetts	5	6	2	------	------	------	177	222	222	10	11	0
Rhode Island	0	0	0	13	1	------	8	73	38	2	5	1
Connecticut	0	0	0	------	------	1	37	69	69	5	7	0
MIDDLE ATLANTIC												
New York	6	9	9	(1)	[1] 2	[1] 2	152	668	491	34	26	4
New Jersey	1	0	2	4	3	2	121	513	251	10	11	1
Pennsylvania	5	6	6	1	------	------	131	92	98	10	22	3
EAST NORTH CENTRAL												
Ohio	0	7	7	1	5	5	18	156	73	7	7	0
Indiana	7	2	2	3	3	3	4	48	14	4	0	1
Illinois	3	10	14	1	12	4	32	232	106	5	16	1
Michigan [2]	4	2	3	------	2	1	84	793	241	7	15	2
Wisconsin	1	1	2	9	7	7	168	468	373	1	4	0
WEST NORTH CENTRAL												
Minnesota	3	5	1	------	------	1	33	105	23	3	0	0
Iowa	3	1	1	------	------	------	30	24	53	4	0	0
Missouri	5	4	4	------	------	------	5	29	11	3	11	0
North Dakota	0	0	1	------	------	------	1	40	8	3	0	0
South Dakota	0	0	1	------	------	------	0	7	7	0	1	0
Nebraska	0	4	1	3	1	1	11	10	6	0	0	0
Kansas	1	0	2	4	1	1	22	52	41	0	2	0
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	1	2	2	0	0	0
Maryland [2]	0	0	1	------	2	1	11	58	15	5	7	4
District of Columbia	0	0	0	------	------	------	9	34	14	1	1	0
Virginia	2	7	10	38	39	24	30	46	46	7	10	5
West Virginia	3	4	3	------	2	1	14	88	6	2	0	0
North Carolina	6	4	4	------	------	------	50	37	37	8	7	0
South Carolina	5	12	3	87	133	92	38	14	14	6	4	0
Georgia	7	4	3	7	10	10	12	10	9	0	2	1
Florida	16	4	3	2	9	4	45	10	10	6	1	0
EAST SOUTH CENTRAL												
Kentucky	3	1	2	1	1	------	13	19	19	2	0	1
Tennessee	3	4	2	10	3	8	6	16	25	3	6	0
Alabama	3	1	4	12	31	11	12	27	27	4	5	3
Mississippi [2]	3	2	2	------	------	------	------	------	------	0	3	0
WEST SOUTH CENTRAL												
Arkansas	3	4	3	13	------	5	21	11	11	1	4	1
Louisiana	5	12	5	8	6	4	7	5	5	2	3	0
Oklahoma	0	3	2	------	2	4	9	9	6	3	3	0
Texas	23	23	22	160	231	79	125	101	101	8	4	1
MOUNTAIN												
Montana	0	0	0	------	------	1	3	65	25	1	0	0
Idaho	0	0	0	------	2	------	2	4	3	0	0	0
Wyoming	0	0	0	------	------	------	9	8	4	0	0	0
Colorado	6	3	10	------	2	5	8	9	24	0	0	0
New Mexico	0	0	1	------	1	1	18	8	8	0	0	0
Arizona	0	0	0	16	31	25	13	12	12	0	1	1
Utah [2]	0	0	0	6	------	------	19	33	33	2	1	0
Nevada	1	0	0	------	------	------	21	5	1	0	1	0
PACIFIC												
Washington	2	6	1	------	------	------	61	36	36	3	4	0
Oregon	1	7	1	7	5	5	39	32	36	2	7	0
California	17	11	13	3	37	11	442	288	288	11	23	1
Total	154	169	148	409	584	327	2,094	4,701	3,313	186	237	34
29 weeks	5,998	6,615	6,974	336,856	79,477	150,548	586,074	528,294	461,421	12,418	12,779	1,302

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended July 22, 1944, and comparison with corresponding week of 1943, and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever[2]		
	Week ended—		Median 1939–43	Week ended—		Median 1939–43,	Week ended—		Median 1939–43,	Week ended—		Median 1939–43
	July 22, 1944	July 24, 1943		July 22, 1944	July 24, 1943		July 23 1944	July 24, 1943		July 22, 1944	July 24, 1943	
NEW ENGLAND												
Maine	0	0	0	7	16	5	0	0	0	0	0	0
New Hampshire	3	0	0	0	2	2	0	0	0	1	0	0
Vermont	0	0	0	2	2	2	0	0	0	0	0	0
Massachusetts	6	0	1	35	93	37	0	0	0	3	8	1
Rhode Island	0	1	0	0	10	3	0	0	0	0	0	0
Connecticut	0	2	1	12	18	12	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	153	10	6	67	79	79	0	0	0	4	8	10
New Jersey	7	0	1	15	19	24	0	0	0	1	3	3
Pennsylvania	56	2	3	62	41	43	0	0	0	3	6	10
EAST NORTH CENTRAL												
Ohio	14	2	1	51	47	51	0	0	0	2	39	9
Indiana	10	1	1	10	10	10	0	0	0	4	3	3
Illinois	13	7	6	35	37	59	0	2	1	4	5	8
Michigan[1]	24	1	7	48	26	61	1	2	1	1	45	6
Wisconsin	2	1	0	37	49	34	0	0	1	1	0	0
WEST NORTH CENTRAL												
Minnesota	3	0	0	29	10	19	0	0	0	0	0	0
Iowa	8	0	1	8	8	9	0	1	1	1	0	2
Missouri	3	4	2	9	10	12	0	0	1	8	5	5
North Dakota	3	0	1	5	0	2	0	0	0	0	0	0
South Dakota	0	0	0	0	5	6	0	0	0	0	0	0
Nebraska	3	1	1	2	4	3	0	0	0	0	0	0
Kansas	5	7	2	9	13	13	0	0	0	0	1	2
SOUTH ATLANTIC												
Delaware	0	0	0	0	1	1	0	0	0	0	0	0
Maryland[1]	10	1	1	21	21	13	0	0	0	4	2	3
District of Columbia	8	0	0	3	3	3	0	0	0	0	0	0
Virginia	30	2	2	18	3	4	0	0	0	4	2	7
West Virginia	4	0	2	25	13	13	0	0	0	5	8	10
North Carolina	62	3	3	18	6	10	2	0	0	12	3	12
South Carolina	4	2	3	5	5	2	0	0	0	11	8	12
Georgia	5	1	4	11	11	11	0	0	0	14	14	23
Florida	5	0	1	4	1	1	0	0	0	7	3	3
EAST SOUTH CENTRAL												
Kentucky	77	0	4	8	7	15	1	1	0	11	9	11
Tennessee	1	0	1	17	18	12	0	0	0	9	6	14
Alabama	7	0	3	8	10	6	0	0	0	8	12	8
Mississippi[1]	5	0	1	3	2	2	0	0	0	4	14	7
WEST SOUTH CENTRAL												
Arkansas	0	6	1	5	9	2	0	0	0	9	9	19
Louisiana	5	10	3	4	2	3	0	0	0	15	7	14
Oklahoma	4	42	0	0	6	6	0	0	0	4	3	9
Texas	9	96	7	31	18	17	1	2	0	21	25	38
MOUNTAIN												
Montana	1	0	0	4	4	6	0	0	0	1	1	0
Idaho	0	0	0	6	0	2	0	0	0	0	0	0
Wyoming	0	0	0	2	7	1	0	0	0	0	1	0
Colorado	0	5	0	9	23	9	0	0	0	1	1	3
New Mexico	0	2	1	7	0	1	0	1	0	0	5	3
Arizona	0	4	0	11	8	4	0	3	1	0	3	2
Utah[1]	0	0	0	12	7	6	0	0	0	0	0	1
Nevada	0	0	0	1	0	0	0	0	0	0	0	0
PACIFIC												
Washington	1	2	0	45	18	11	0	0	0	2	0	1
Oregon	6	3	2	4	6	4	0	0	0	2	1	2
California	11	111	15	87	99	42	0	0	0	6	4	6
Total	568	329	137	812	807	807	5	12	13	184	264	308
29 weeks	2,324	1,955	1,148	144,569	94,785	94,785	283	596	1,159	2,585	2,424	3,277

[1] Period ended earlier than Saturday.

[2] Including paratyphoid fever cases reported separately, as follows: New Hampshire 1, Massachusetts 3, Ohio 1, Illinois 1, South Carolina 2, Georgia 7, Florida 2, Tennessee 1, Arkansas 3, Texas 1, California 2.

Telegraphic morbidity reports from State health officers for the week ended July 22, 1944, and comparison with corresponding week of 1943, and 5-year median—Con.

Division and State	Whooping cough			Week ended July 22, 1944								
	Week ended—		Median, 1939–43	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	July 22, 1944	July 24, 1943			Amebic	Bacillary	Unspecified					
NEW ENGLAND												
Maine	2	64	28	0	0	0	0	0	0	0	0	0
New Hampshire	0	0	4	0	0	0	0	0	0	0	0	0
Vermont	19	10	10	0	0	0	0	0	0	0	0	0
Massachusetts	81	66	132	0	0	23	0	0	0	0	0	0
Rhode Island	4	43	22	0	0	0	0	0	0	0	0	0
Connecticut	68	27	45	0	0	1	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	110	269	291	0	2	5	0	1	0	1	0	0
New Jersey	76	184	184	0	0	0	0	1	0	0	0	0
Pennsylvania	63	255	336	0	0	0	0	0	0	0	0	0
EAST NORTH CENTRAL												
Ohio	182	193	193	0	0	0	0	0	1	0	0	0
Indiana	25	61	49	0	0	0	0	0	0	1	0	0
Illinois	63	223	223	0	1	0	0	2	0	0	0	0
Michigan [2]	134	354	269	0	0	2	0	0	0	0	0	0
Wisconsin	136	304	243	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	43	85	39	0	6	0	0	0	0	0	1	0
Iowa	14	47	33	0	0	0	0	1	0	0	0	0
Missouri	44	36	49	0	0	0	0	0	0	2	0	0
North Dakota	6	35	10	0	0	0	2	1	0	0	0	0
South Dakota	12	4	4	0	0	0	0	0	0	0	0	0
Nebraska	10	9	9	0	0	0	0	0	0	0	0	0
Kansas	59	58	53	0	0	0	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	1	0	3	0	0	0	0	0	0	0	0	0
Maryland [2]	128	112	103	0	0	0	4	2	0	5	0	0
District of Columbia	2	54	21	0	0	0	0	0	0	0	0	0
Virginia	52	103	101	0	1	0	293	0	0	5	1	0
West Virginia	32	71	29	0	0	0	0	0	0	1	0	0
North Carolina	199	268	239	0	0	0	0	0	0	5	0	0
South Carolina	106	131	49	0	0	41	0	0	0	0	0	3
Georgia	22	38	40	0	0	11	[4] 0	0	0	0	0	48
Florida	34	12	12	0	4	1	0	1	0	0	0	23
EAST SOUTH CENTRAL												
Kentucky	82	57	57	0	0	3	0	0	0	2	0	0
Tennessee	33	66	48	0	0	0	15	0	0	1	3	1
Alabama	31	54	27	0	0	0	0	0	0	0	0	51
Mississippi [2]	----	----	----	0	0	0	0	0	0	0	0	5
WEST SOUTH CENTRAL												
Arkansas	22	25	25	0	1	65	0	0	0	0	5	0
Louisiana	0	7	11	0	4	26	0	0	0	0	2	6
Oklahoma	5	18	18	0	0	0	0	0	0	2	0	0
Texas	231	336	190	0	33	523	0	0	0	0	1	48
MOUNTAIN												
Montana	9	36	27	0	0	0	0	0	0	0	0	0
Idaho	0	5	5	0	0	0	0	0	0	0	0	0
Wyoming	1	4	6	0	0	0	0	0	0	0	1	0
Colorado	21	9	15	0	0	0	0	0	0	0	0	0
New Mexico	3	4	19	0	0	0	0	0	0	0	0	0
Arizona	19	30	17	0	0	0	34	0	0	0	0	0
Utah [2]	76	66	66	0	0	0	0	0	0	0	0	0
Nevada	1	----	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	32	70	49	0	1	0	0	0	0	0	0	
Oregon	10	56	23	0	0	0	0	0	0	0	0	0
California	81	242	242	0	2	1	0	6	0	0	0	0
Total	2,384	4,191	4,061	0	55	702	348	15	1	25	14	185
Same week 1943	4,191	----	----	0	106	619	487	13	1	35	16	131
Same week 1942	3,439	----	----	1	31	341	256	12	0	33	21	141
29 weeks 1944	54,263	----	----	23	906	11,335	[4] 3,951	323	16	262	344	1,828
29 weeks 1943	118,067	----	----	37	1,154	8,128	3,099	336	17	256	534	1,638
29 weeks 1942	109,174	----	[5] 113,405	51	581	4,380	2,924	258	32	[5] 277	574	[5] 1,078

[2] Period ended earlier than Saturday.
[4] Corrected report. Diagnosis was changed in 67 cases reported in Georgia for the week ended June 24 as dysentery, unspecified.
[5] Five-year median 1939–43.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 8, 1944

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	8	0	1	0	2	0	0	0
New Hampshire:												
Concord	0	0	------	0	2	0	0	0	0	0	0	0
Massachusetts:												
Boston	1	0	------	0	95	1	10	0	29	0	1	9
Fall River	0	0	------	0	2	0	0	0	0	0	0	0
Springfield	0	0	------	0	9	0	0	1	7	0	0	9
Worcester	0	0	------	0	2	0	10	0	3	0	0	4
Rhode Island:												
Providence	1	0	------	0	12	0	1	1	1	0	0	2
Connecticut:												
Bridgeport	0	0	------	0	0	0	2	0	2	0	0	2
Hartford	0	0	------	0	10	0	2	0	5	0	1	0
New Haven	0	0	------	0	4	0	0	0	1	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	1	3	3	3	2	0	0	0
New York	1	0	1	1	72	9	35	6	51	0	4	24
Rochester	0	0	------	0	64	1	4	0	0	0	1	1
Syracuse	0	0	------	0	2	0	1	0	0	0	0	7
New Jersey:												
Camden	0	0	------	0	0	1	0	0	1	0	0	0
Newark	0	0	------	0	21	3	2	0	4	0	1	4
Trenton	0	0	------	0	0	0	0	0	0	0	0	1
Pennsylvania:												
Philadelphia	1	0	------	0	19	7	8	0	33	0	0	12
Pittsburgh	0	0	1	1	0	6	4	14	7	0	0	10
Reading	0	0	------	0	0	0	0	0	1	0	0	2
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	------	0	4	4	3	2	10	0	0	8
Cleveland	1	0	------	0	1	2	2	0	10	0	0	22
Columbus	0	0	------	0	0	0	0	0	0	0	0	11
Indiana:												
Fort Wayne	0	0	------	0	0	0	3	0	0	0	0	0
Indianapolis	2	0	------	0	10	1	7	0	1	0	0	11
South Bend	0	0	------	0	0	0	0	0	0	0	0	0
Terre Haute	0	0	------	0	0	0	0	0	0	0	0	1
Illinois:												
Chicago	2	0	------	0	45	1	11	4	23	0	0	25
Springfield	0	0	------	0	0	0	1	0	0	0	0	0
Michigan:												
Detroit	4	0	------	2	47	4	4	5	13	0	1	38
Flint	0	0	------	0	0	0	0	0	0	0	0	0
Grand Rapids	0	0	------	1	0	0	1	0	1	0	0	1
Wisconsin:												
Kenosha	0	0	------	0	13	1	0	0	0	0	0	26
Milwaukee	0	0	------	0	70	1	5	1	10	0	0	15
Racine	0	0	------	0	42	0	0	0	1	0	0	6
Superior	0	0	------	0	1	0	0	0	3	0	0	0
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	36	0	1	0	6	0	0	0
Minneapolis	3	0	------	0	5	0	3	1	4	0	0	0
St. Paul	0	0	------	0	2	1	3	2	1	0	0	11
Missouri:												
Kansas City	0	0	------	0	4	3	3	0	2	0	0	1
St. Joseph	0	0	------	0	0	0	0	0	0	0	0	1
St. Louis	0	0	------	0	3	2	6	0	2	0	0	23
North Dakota:												
Fargo	0	0	------	0	0	0	1	1	1	0	0	0

City reports for week ended July 8, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	2	0	------	0	4	0	1	1	4	0	0	0
Kansas:												
Topeka	0	0	------	0	5	0	1	0	1	0	1	3
Wichita	0	0	------	0	0	0	4	0	0	0	0	5
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	0	0	3	0	1	0	0	1
Maryland:												
Baltimore	4	0	1	1	10	4	8	0	8	0	0	76
Cumberland	0	0	0	0	0	0	0	0	1	0	0	0
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	0	0	1	0	28	2	4	0	2	0	0	1
Virginia:												
Lynchburg	0	0	------	0	2	0	0	2	0	0	1	1
Richmond	0	0	------	0	3	1	1	0	3	0	0	0
Roanoke	0	0	------	0	1	0	0	1	0	0	0	6
West Virginia:												
Charleston	0	0	------	0	0	0	0	0	1	0	0	0
Wheeling	0	0	------	0	0	0	1	0	0	0	0	0
North Carolina:												
Raleigh	0	0	------	0	3	0	0	0	0	0	0	4
Wilmington	0	0	------	0	0	0	1	1	1	0	0	18
Winston-Salem	0	0	1	0	3	0	0	4	0	0	0	1
South Carolina:												
Charleston	0	0	------	0	0	2	5	0	0	0	1	0
Georgia:												
Atlanta	1	0	2	0	3	0	1	0	1	0	0	0
Brunswick	0	0	------	0	0	0	0	0	0	0	0	0
Savannah	0	0	------	0	0	0	1	1	1	0	0	0
Florida:												
Tampa	0	0	------	0	1	0	0	1	0	0	0	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	------	0	2	0	3	0	2	0	1	22
Nashville	0	0	------	0	3	1	2	0	0	0	1	3
Alabama:												
Birmingham	0	0	------	0	2	1	1	0	0	0	0	1
Mobile	0	0	1	0	0	0	1	1	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	1	0	0	0	0	0	0	0
Louisiana:												
Shreveport	0	0	------	0	0	0	3	0	0	0	5	0
Texas:												
Dallas	3	0	------	0	3	0	1	0	0	0	0	12
Houston	2	0	------	0	1	0	7	0	1	0	1	0
San Antonio	0	0	------	0	0	0	4	0	0	0	0	0
MOUNTAIN												
Montana:												
Billings	1	0	------	0	0	0	0	0	0	0	0	1
Great Falls	0	0	------	0	0	0	0	0	0	0	0	0
Helena	0	0	------	0	0	0	0	0	0	0	0	0
Missoula	0	0	------	0	2	0	0	0	1	0	1	0
Idaho:												
Boise	0	0	------	0	0	0	0	0	1	0	0	1
Colorado:												
Denver	3	0	------	0	2	0	3	1	4	0	0	7
Pueblo	0	0	------	0	2	0	0	0	0	0	0	2
Utah:												
Salt Lake City	0	0	------	0	20	0	1	0	4	0	0	17

City reports for week ended July 8, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	1	0	------	0	12	0	2	1	5	0	0	0
Spokane	0	0	------	0	5	0	1	0	14	0	0	2
Tacoma	0	0	------	0	4	------	0	0	10	0	0	1
California:												
Los Angeles	3	0	2	0	97	3	2	1	24	0	0	12
Sacramento	1	0	------	0	22	3	3	0	13	0	0	3
San Francisco	2	0	------	0	67	1	5	0	27	0	1	0
Total	41	0	10	6	914	69	208	56	367	0	22	490
Corresponding week, 1943	43	------	22	6	2,107	------	226	------	345	0	10	1,069
Average, 1939–43	49	------	31	[1] 9	[2] 1,936	------	[1] 233	------	411	1	28	1,233

[1] 3-year average, 1941–43.
[2] 5-year median.

Dysentery, amebic.—Cases: Chicago, 2; St. Louis, 1; Baltimore, 1.
Dysentery, bacillary.—Cases: Buffalo, 5; New York, 1; Detroit, 2; Charleston, 52; Nashville, 4; Shreveport, 4; Houston, 3; Los Angeles, 6.
Dysentery, unspecified.—Cases: Shreveport, 1.
Rocky Mountain spotted fever.—Cases: Boise, 1.
Tularemia.—Cases: Duluth, 1; Nashville, 1.
Typhus fever, endemic.—Cases: Rochester, 1; Winston-Salem, 1; Savannah, 1; Tampa, 1; Birmingham, 1; Shreveport, 1; Houston, 1; San Antonio, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 33,785,600)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	5.3	0.0	0.0	0.0	378	2.6	70.9	5.3	131	0.0	5.3	76
Middle Atlantic	0.9	0.0	0.9	0.9	83	13.9	26.4	10.6	46	0.0	2.8	28
East North Central	6.1	0.0	0.0	1.8	142	8.5	22.5	7.3	44	0.0	0.6	100
West North Central	9.9	0.0	0.0	0.0	117	11.9	45.8	9.9	42	0.0	2.0	88
South Atlantic	8.2	0.0	8.2	1.6	88	14.7	40.9	16.3	31	0.0	3.3	177
East South Central	5.9	0.0	5.9	0.0	41	11.8	41.3	5.9	12	0.0	11.8	153
West South Central	21.4	0.0	0.0	0.0	21	0.0	64.2	0.0	4	0.0	25.7	51
Mountain	31.8	0.0	0.0	0.0	207	0.0	31.8	7.9	79	0.0	7.9	222
Pacific	11.1	0.0	3.2	0.0	327	11.1	20.6	3.2	147	0.0	1.6	28
Total	6.3	0.0	1.5	0.9	141	10.7	32.2	8.7	57	0.0	3.4	76

PLAGUE INFECTION IN BACA AND BENT COUNTIES, COLO.

Plague infection has been reported proved in a pool of 642 fleas from 81 prairie dogs, *Cynomys* sp., collected June 20 at a location in Bent County 3 miles west and 1 mile north of Deora, Colo., and in a pool of 157 fleas from 55 prairie dogs, *Cynomys* sp., collected on June 27 on a ranch in Baca County located 11 miles west and 7 miles north of Pritchett, Colo.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Honolulu—Dengue fever.—For the period June 16–30, 1944, only 1 case of dengue fever was reported in Honolulu, bringing the total number of cases reported since the beginning of the outbreak to 1,496.

Panama Canal Zone

Notifiable diseases—May 1944.—During the month of May 1944, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Diseases	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	7		2		17				26	
Diphtheria	3						2		5	
Dysentery (amebic)			1				7		8	
Dysentery (bacillary)	3						1		4	
Malaria [1]	16	1			123		79	3	218	4
Measles	1				31				32	
Meningitis, meningococcus					1				1	
Mumps	3				8		2		13	
Paratyphoid fever	1						1		2	
Pneumonia		12		2	57			1	[2] 57	15
Relapsing fever							2		2	
Tuberculosis		27		6	7	3		5	[2] 7	41
Typhoid fever							2	1	2	1
Whooping cough					7				[2] 7	

[1] 32 recurrent cases.
[2] In the Canal Zone only.

* * *

DEATHS DURING WEEK ENDED JULY 15, 1944

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

	Week ended July 15, 1944	Corresponding week, 1943
Data for 93 large cities of the United States:		
Total deaths	8,845	8,151
Average for 3 prior years	7,849	
Total deaths, first 28 weeks of year	264,129	269,954
Deaths under 1 year of age	616	617
Average for 3 prior years	562	
Deaths under 1 year of age, first 28 weeks of year	17,383	18,921
Data from industrial insurance companies:		
Policies in force	66,661,607	65,632,398
Number of death claims	11,148	12,251
Death claims per 1,000 policies in force, annual rate	8.7	9.7
Death claims per 1,000 policies, first 28 weeks of year, annual rate	10.4	10.2

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 24, 1944.—During the week ended June 24, 1944, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		55		203	202	52	23	71	120	726
Diphtheria		4	3	22		4				33
Dysentery (bacillary)				5						5
German measles		7		44	32	3	29	10	52	177
Influenza		4			6				1	11
Measles		14	6	177	304	109	66	70	24	770
Meningitis, meningococcus		1		2	2				1	6
Mumps		5	1	160	164	11	14	36	5	396
Scarlet fever		7	11	100	117	15	7	54	48	359
Tuberculosis (all forms)		5		258	44	17	1	12	35	372
Typhoid and paratyphoid fever				12	1				1	14
Undulant fever				9	1				1	11
Whooping cough		39	1	66	24	4	1	11	26	172

CUBA

Habana—Communicable diseases—4 weeks ended June 24, 1944.—During the 4 weeks ended June 24, 1944, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	24	2	Poliomyelitis	1	
Malaria	1		Tuberculosis	4	2
Measles	8		Typhoid fever	25	5

JAMAICA

Notifiable diseases—4 weeks ended July 1, 1944.—During the 4 weeks ended July 1, 1944, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	11	53	Puerperal fever		1
Diphtheria	5	2	Scarlet fever	1	
Dysentery	2	5	Tuberculosis	41	58
Erysipelas		2	Typhoid fever	10	63
Leprosy		3	Typhus fever	10	1

NEW ZEALAND

Notifiable diseases—4 weeks ended June 17, 1944.—During the 4 weeks ended June 17, 1944, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Actinomycosis	1		Puerperal fever	10	
Cerebrospinal meningitis	16	1	Scarlet fever	607	2
Diphtheria	84	6	Tetanus	1	1
Dysentery (bacillary)	5		Trachoma	7	
Erysipelas	30	1	Tuberculosis (all forms)	172	66
Influenza	3	3	Typhoid fever	6	
Malaria	6		Undulant fever	6	

SWEDEN

Notifiable diseases—May 1944.—During the month of May 1944, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	15	Poliomyelitis	43
Diphtheria	155	Scarlet fever	3,016
Carriers	136	Syphilis	128
Dysentery	4	Typhoid fever	2
Gonorrhea	1,447	Undulant fever	3
Hepatitis, epidemic	392	Weil's disease	6
Paratyphoid fever	17		

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]

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

Place		January–April 1944	May 1944	June 1944—week ended—			
				3	10	17	24
ASIA							
Ceylon	C	2					
India	C	53,392	26,045				
Calcutta	C	1,406	656	227	151	105	66
Chittagong	C	63					
Madras	C	36					
Negapatam	C	17					

PLAGUE

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

Place		January-April 1944	May 1944	June 1944—week ended— 3	10	17	24
AFRICA							
Belgian Congo	C	3			1		
Plague-infected rats		P					
British East Africa:							
Kenya	C	1					
Uganda	C	4					
Egypt	C	339	179	24	24	23	8
Port Said	C	7	6	2	4	7	4
Suez	C	140	11		3	2	
French West Africa: Dakar	C	7	8				[1] 25
Madagascar	C	63					
Morocco (French)	C	22	32				
Rhodesia, northern	C	1					
Union of South Africa	C	23					
ASIA							
China: Foochow	C	P					
India	C	6,432	282				
Indochina	C	30	19		1		
Palestine	C	1					
EUROPE							
Portugal: Azores	C	6	1	1		1	
SOUTH AMERICA							
Bolivia:							
Chuquisaca Department	C	4					
Tarija Department	C					6	
Ecuador: Chimborazo Department	C	1					
Peru:							
Ancash Department [2]	C	3					
Libertad Department	C	5					
Lima Department	C	17					
Piura Department	C	1					
OCEANIA							
Hawaii Territory:							
Hamakua District	D	[3] 4					
Plague-infected rats [4]		[5] 41	1				

[1] For the period June 4–28, 1944.
[2] It is reported that up to the middle of June 1944, approximately 60 cases of plague with 4 deaths have occurred in Ancash Department, Peru.
[3] Includes 1 death from pneumonic plague.
[4] 53 fleas were also proved positive for plague on March 7, 1944.
[5] Includes 12 plague-infected mice.

SMALLPOX

[C indicates cases; P, present]

AFRICA							
Algeria	C	454	141				
Angola	C	20					
Basutoland	C	130					
Belgian Congo	C	918	75	32			
British East Africa:							
Kenya	C	2,192	291	46	35	33	
Mombasa	C	126	9	3	2		2
Tanganyika	C	733	244	173			
Uganda	C	1,513	361		117		
Cameroon (French)	C	333	15				
Dahomey	C	44	15				
Egypt	C	7,135	1,733	210	258		
French Equatorial Africa	C	657					
French Guinea	C	369	57		117		
French West Africa: Dakar	C	4	7		7		
Gambia	C	13					
Gold Coast	C	5					
Ivory Coast	C	339	46				
Morocco (French)	C	576	16				
Mozambique	C	1					
Nigeria	C	2,091	529	138	121	62	
Niger Territory	C	456	62		8		
Senegal	C	85	23		11		
Sierra Leone	C	90					
Sudan (French)	C	1,700	81		4		
Tunisia	C	5					
Union of South Africa	C	27	25	8	15	2	

SMALLPOX—Continued

[C indicates cases; P, present]

Place		January–April 1944	May 1944	June 1944—week ended— 3	10	17	24
ASIA							
Arabia	C	[1] 9					
Ceylon	C	8					
China: Kunming (Yunnan Fu)	C	25	15	3			
India	C	146,137	31,025				
Indochina	C	1,265	116		52		
Iran	C	1					
Iraq	C	27			1	3	
Palestine	C	55	30	12	7	8	5
Syria and Lebanon	C	165	5				
EUROPE							
Gibraltar	C	P					
Great Britain:							
Birkenhead	C		1				
London	C	[2] 13					1
Greece: Hevros Department	C	222					
Portugal	C	13	1	1	3	7	2
Spain	C	121	8				
Turkey	C	5,311					
NORTH AMERICA							
Guatemala	C	1					
Honduras	C	6	1				
Mexico	C	1,200					
SOUTH AMERICA							
Bolivia	C	162	75				
Brazil	C	33	28	12	14		
Colombia	C	148	61				18
Ecuador	C	4					
Peru	C	130					
Lima	C	19					
Venezuela	C	77	66				

[1] Includes 4 imported cases.
[2] Includes 1 imported case from the Middle East.

TYPHUS FEVER

[C indicates cases]

AFRICA							
Algeria	C	491	234				
Basutoland	C	4					
Belgian Congo	C	6	1				
British East Africa: Kenya	C	5	2				
Egypt	C	9,344	2,953	657	623		
French West Africa: Dakar	C	11	4				
Morocco (French)	C	1,160	448				
Morocco (Spanish)	C	5					
Mozambique	C	2					
Nigeria	C	2					
Rhodesia, northern	C	17					
Tunisia	C	364	156				
Union of South Africa	C	3,678	206				
ASIA							
Arabia: Western Aden Protectorate	C	[1] 15					
China: Kunming (Yunnan Fu)	C	24	15	1			5
India	C	3					
Indochina	C	586	281				
Iran	C	4,045	1,202				
Iraq	C	294	202	13	27		
Palestine	C	277	80	6	8	10	5
Syria and Lebanon	C	351	38	10	14		
Trans-Jordan	C	24					
EUROPE							
Belgium	C		8				
Bulgaria	C	624					
France	C	5	1				
Greece	C	146					

[1] A report dated Mar. 30, 1944, states that an estimated 800 deaths from typhus fever have been reported in Western Aden Protectorate, Arabia.

TYPHUS FEVER—Continued

[C indicates cases]

Place		January–April 1944	May 1944	June 1944—week ended— 3	10	17	24
Hungary	C	1,582	649			[2] 405	
Irish Free State	C	1	2	1	1		1
Netherlands	C	7					
Portugal	C	1				1	
Rumania	C	5,058					
Slovakia	C	238	62	[3] 9			
Spain	C	308	50				
Turkey	C	1,585	391				
Yugoslavia	C	2,553	[4] 1,212				
NORTH AMERICA [5]							
Costa Rica	C		2				
Dominican Republic	C		4	2	3	1	
Guatemala	C	996	198				
Jamaica	C	12	14	4	4		5
Mexico	C	811					
Panama Canal Zone	C	1					
Puerto Rico (endemic)	C	33	21	4			20
Salvador	C	3					
Virgin Islands	C	2					
SOUTH AMERICA							
Bolivia	C	39	30				
Brazil	C		1				
Chile	C	134	32	10	4	4	
Colombia	C					[6] 104	
Curacao	C	1					
Ecuador	C	134					
Peru	C	175					
Venezuela	C	28	6				
OCEANIA							
Australia	C	74	17	2	5	3	2
Hawaii Territory	C	26	2	2	2		2

[2] For 3 weeks.
[3] For 2 weeks.
[4] For the period Apr. 15–May 7, 1944.
[5] Cases of typhus fever listed in this area are probably of endemic type.
[6] For the period Mar. 31–June 15, 1944.

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA							
Belgian Congo:							
Babeyru	D	1					
Bondo	D	1					
Leopoldville	C	1					
Gold Coast:							
Kintampo	C			1			
Tamale	C	[1] 1					
EUROPE							
Portugal: Lisbon.[2]							
SOUTH AMERICA							
Bolivia:							
La Paz Department	C		1				
Santa Cruz Department	C		3				
Brazil:							
Acre Territory	D	1					
Matto Grosso State	D	3					
Colombia:							
Boyaca Department	D	2					
Caldas Department	D	1					
Cundinamarca Department	D	1					
Santander Department	D	4					

[1] Suspected.
[2] According to information dated Jan. 21, 1944, it is reported that a vessel which called at the islands of Sao Tome and Cape Verde arrived at Lisbon, Portugal, with cases of yellow fever on board.

COURT DECISION ON PUBLIC HEALTH

City health commissioner held to be an employee.—(Ohio Supreme Court; *Scofield* v. *Strain, Mayor, et al., State ex rel. Reilly* v. *Hamrock, Mayor, et al.*, 51 N.E.2d 1012; decided December 8, 1943.) In two cases before the Supreme Court of Ohio the appellant in each case contended that, as health commissioner of a city health district under employment by the board of health, he was not a public officer but was an employee and was therefore within the provisions of section 486–19 of the General Code, as amended, effective September 4, 1941, which read as follows: "Present employees of city health districts and city health departments shall continue to hold their positions until removed in accordance with the civil service laws."

The primary question presented was whether the position of city health commissioner was an office or an employment and whether the occupant thereof was an officer or an employee. The court reviewed the general principles which were pertinent in determining whether or not a position was a public office and also detailed some of the relevant statutory provisions on public health, among them being the one declaring that "in any city health district, the board of health or person or persons performing the duties of a board of health shall appoint for whole or part time service a health commissioner and may appoint such public health nurses, clerks, physicians, and other persons as they deem necessary." It was to be observed, said the court, that the authority for the appointment of a health commissioner was precisely the same as for the appointment of nurses, physicians, guards, and other employees and that all were under the direction, supervision, and control of the board of health. The court took the view that the application of the general principles enumerated by it warranted the conclusion that a health commissioner appointed by the board of health of a city health district was not an officer but was an employee of the board of health and that the position therefore came within the provisions of the above-quoted section 486–19 of the General Code.

The supreme court also held that the said section 486–19 was not violative of the section of the State constitution inhibiting the passage of retroactive laws or laws impairing the obligation of contracts nor of that section of the constitution which provided as follows: "The election and appointment of all officers * * * shall be made in such manner as may be directed by law; but no appointing power shall be exercised by the General Assembly, except as prescribed in this Constitution."

Statutes held not violated by sale of raw pork containing trichinae.—(Ohio Court of Appeals; *Leonardi et al.* v. *Habermann Provision Co.*, 52 N.E.2d 85; decided July 6, 1943.) Six plaintiffs brought separate actions for damages, each claiming to have been poisoned by eating pork purchased from the defendant. All of the plaintiffs became ill after eating sausage stated to have been made from pork shoulder purchased from the defendant and all of the cases were diagnosed as trichinosis. The actions were founded on the claim that the sale of fresh pork in which trichinae larvae are embedded was a violation of the Ohio statutes and that such violation made the defendant guilty of negligence per se as to anyone injured by the use of such meat. One of the statutory provisions involved declared that food was adulterated if it consisted wholly or in part of a diseased, decomposed, putrid, infected, tainted, or rotten animal or vegetable substance or article, whether manufactured or not. The other statutory provision penalized the sale, offering for sale, or possession with intent to sell, of diseased. corrupted, adulterated, or unwholesome provisions without making the condition thereof known to the buyer.

The evidence showed that neither the Federal nor State governments attempted to discover the presence of trichinae larvae in meat certified as fit for human consumption. According to the Ohio Court of Appeals the facts pointed to the inescapable conclusion that dealers in meat products could not with any degree of certainty certify against the presence of trichinae in absolutely fresh pork. The court said that it had to be conceded that there was much to be said for the interpretation of the pure food statutes that they did not require the impossible of those who came within their provisions. "That the statute would have application to food products when used in a normal way is not questioned, but certainly the protection of the statute should not be extended to the attempted use of food products in unusual or abnormal ways. Pork is not intended to be consumed as food in its raw state." The conclusion was reached that the above-mentioned statutes, under a proper construction, were not violated by the selling of raw pork containing trichinae.

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