Center for Disease Control

Foodborne and Waterborne Disease Outbreaks

Annual Summary 1976
Issued October 1977

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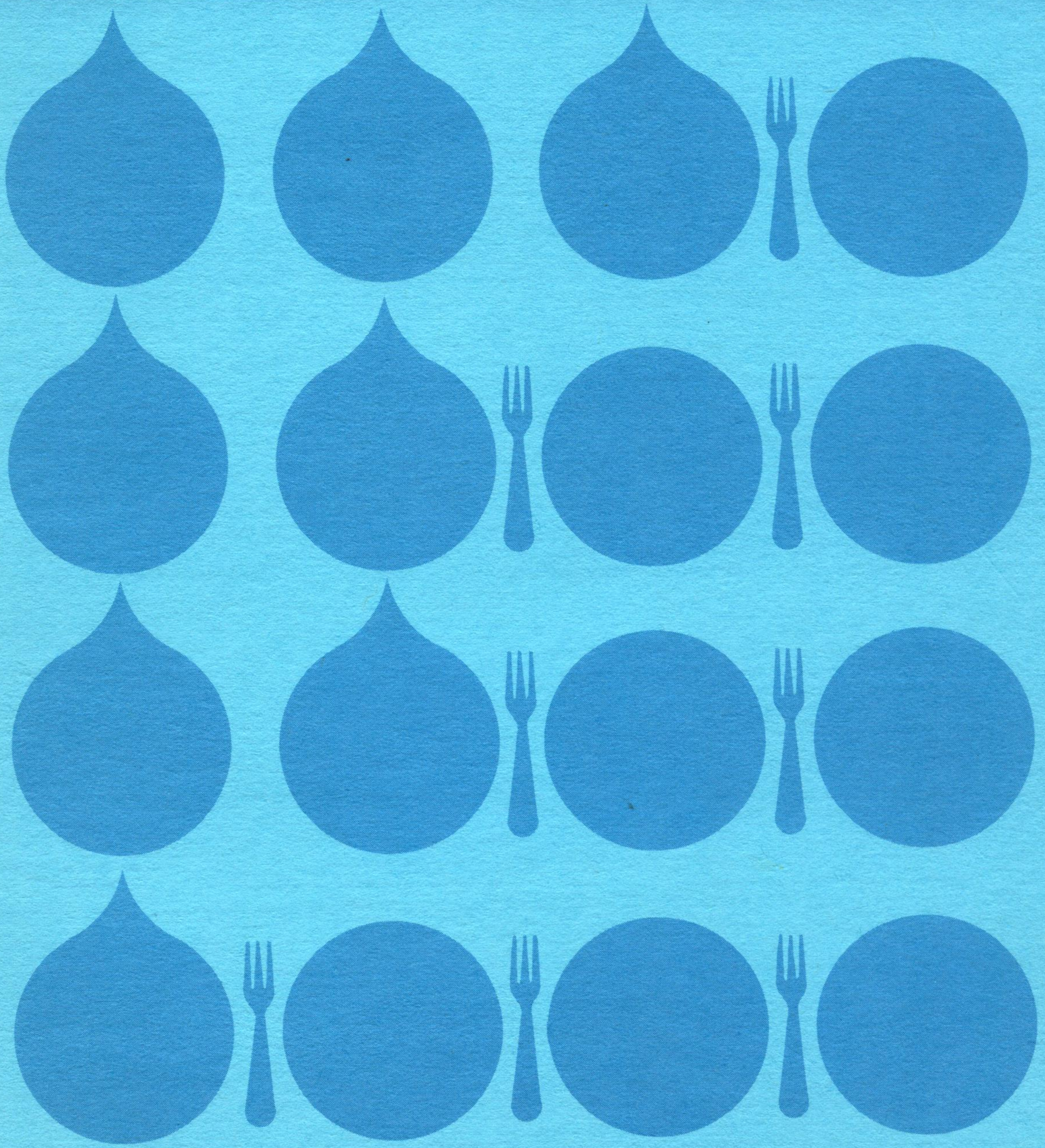

PREFACE

This report summarizes information received from state and local health departments, the Food and Drug Administration, the U.S. Department of Agriculture, and other pertinent sources. The information is preliminary and is intended primarily for use by those with responsibility for disease control activities. Anyone desiring to quote this report should contact the Enteric Diseases Branch for confirmation and further interpretation.

Contributions to the report are most welcome. Please address them to:

Center for Disease Control
ATTN: Bureau of Epidemiology
Bacterial Diseases Division
Enteric Diseases Branch
Atlanta, Georgia 30333

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I. INTRODUCTION

The reporting of foodborne and waterborne diseases in the United States began about 50 years ago when state and territorial health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of enteric fever be investigated and reported. The purpose was to obtain information about the role of food, milk, and water in outbreaks of intestinal illness as the basis for sound public health action. Beginning in 1923, the United States Public Health Service published summaries of outbreaks of gastrointestinal illness attributed to milk. In 1938, it added summaries of outbreaks caused by all foods. These early surveillance efforts led to the enactment of important public health measures which had a profound influence in decreasing the incidence of enteric diseases, particularly those transmitted by milk and water.

From 1951 through 1960 the National Office of Vital Statistics reviewed reports of outbreaks of foodborne illness and published summaries of them annually in Public Health Reports. In 1961 the Center for Disease Control (CDC), then the Communicable Disease Center, assumed responsibility for publishing reports on foodborne illness. For the period 1961-66 CDC discontinued publication of annual reviews, but reported pertinent statistics and detailed individual investigations in the Morbidity and Mortality Weekly Report (MMWR).

In 1966 the present system of surveillance of foodborne and waterborne diseases began with the incorporation of all reports of enteric disease outbreaks attributed to microbial or chemical contamination of food or water into an annual summary. Since 1966 the quality of investigative reports has improved primarily as a result of more active participation by state and federal agencies in the investigation of foodborne and waterborne outbreaks. In this report data from foodborne and waterborne disease outbreaks reported to CDC in 1976 are summarized.

Foodborne and waterborne disease surveillance has traditionally served 3 objectives:

1. Disease Control: Early identification and removal of contaminated products from the commercial market, correction of faulty food preparation practices in food service establishments and in the home, and identification and appropriate treatment of human carriers of foodborne pathogens are the fundamental control measures resulting from surveillance of foodborne disease. Identification of contaminated water sources and adequate purification of these sources are the primary control measures in the surveillance of waterborne disease outbreaks. Rapid reporting and thorough investigation of outbreaks are important for prevention of subsequent outbreaks.

2. Knowledge of Disease Causation: The responsible pathogen has not been identified in 30% to 60% of foodborne disease outbreaks reported to CDC in each of the last 5 years. In many of these outbreaks pathogens known to cause foodborne illness may not have been identified because of late or incomplete laboratory investigation. In others the responsible pathogen may have escaped detection even when a thorough laboratory investigation was carried out because the pathogen is not yet appreciated as a cause of foodborne disease or because it cannot yet be identified by available laboratory techniques. These pathogens might be identified and suitable measures to control diseases caused by them might be instituted as a result of thorough clinical, epidemiologic, and laboratory investigations. Pathogens suspected of being, but not yet determined to be etiologic agents in foodborne disease include Group D *Streptococcus*, *Citrobacter*, *Enterobacter*, *Klebsiella*, *Pseudomonas*, and the presumably viral agents of acute infectious non-bacterial gastroenteritis. Other pathogens such as *Escherichia coli*, *Bacillus cereus*, *Yersinia enterocolitica*, and *Vibrio*

parahaemolyticus are known causes of foodborne illness, but the extent and importance of their role have not as yet been determined. The etiologic agent(s) responsible for the majority of waterborne outbreaks also awaits identification. In waterborne disease, as in foodborne disease, the roles of a variety of viral and bacterial agents, e.g., Y. enterocolitica and parasitic agents, e.g., Giardia lamblia, remain to be clarified.

3. Administrative Guidance: The collection of data from outbreak investigations permits assessment of trends in etiologic agents and food vehicles and focuses on common errors in food and water handling. By compiling the data in an annual summary, it is hoped that local and state health departments and others involved in the implementation of food and water protection programs will be kept informed of the factors involved in food and waterborne disease outbreaks. Comprehensive surveillance should result in a clearer appreciation of priorities in food and water protection, institution of better training programs, and more rational utilization of available resources.

II. FOODBORNE DISEASE OUTBREAKS

A. Definition of Outbreak

For the purpose of this report a foodborne disease outbreak is defined as an incident in which 1) 2 or more persons experience a similar illness, usually gastrointestinal, after ingestion of a common food, and 2) epidemiologic analysis implicates the food as the source of the illness. There are a few exceptions; 1 case of botulism or chemical poisoning constitutes an outbreak.

In this report outbreaks have been divided into 2 categories:

1. Laboratory confirmed--Outbreaks in which laboratory evidence of a specific etiologic agent is obtained and specified criteria are met (see Section G).
2. Undetermined etiology--Outbreaks in which epidemiologic evidence implicates a food source, but adequate laboratory confirmation is not obtained. These outbreaks are subdivided into 4 subgroups by incubation period of the illnesses--less than 1 hour (probable chemical), 1 to 7 hours (probable Staphylococcus), 8 to 14 hours (probable Clostridium perfringens), and greater than 14 hours (other infectious agents).

B. Source of Data

The general public and local, state, and federal agencies which have responsibility for public health and food protection participate in foodborne disease surveillance. Consumers, physicians, hospital personnel, and persons involved with food service or processing report complaints of illness to health departments or regulatory agencies. Local health department personnel (epidemiologists, sanitarians, public health nurses, etc.) carry out most epidemiologic investigations of these reports and make their findings available to state health departments. State agencies concerned with food safety frequently participate in the initial investigation of the outbreak and offer laboratory support. Occasionally, on special request, CDC participates in an investigation, particularly if the outbreak is large or involves products that move in interstate commerce. State or other officials eventually summarize the findings of the investigation on the standard CDC reporting form (see Section E) and send to CDC.

The 2 federal regulatory agencies which have major responsibilities for food protection, the Food and Drug Administration (FDA) and Department of Agriculture (USDA) report episodes of foodborne illness to CDC and to state and local health authorities. CDC and state and local health authorities, in turn, report to FDA or USDA any foodborne disease outbreaks which might involve commercial products. The U.S. Armed Forces also report outbreaks directly to CDC.

By special arrangement pharmaceutical companies immediately report all requests for botulinal antitoxin to CDC. This is sometimes the first communication of a botulism outbreak to public health authorities, although physicians are urged to promptly report all suspect botulism cases. In botulism outbreaks CDC works closely with physicians, state and local health authorities, and FDA or USDA representatives to provide diagnostic and therapeutic consultation and to rapidly identify the responsible food or foods.

For 1976 other sources of foodborne disease data were the Morbidity and Mortality Weekly Report, the Salmonella Surveillance Activity, and the Trichinosis Surveillance Activity.

C. Interpretation of Data

The limitations on the quantity and quality of data in this report must be appreciated in order to avoid misinterpretation. The number of outbreaks of foodborne disease reported by this surveillance system clearly represents a minute fraction of the total number that occur. The likelihood of an outbreak coming to the attention of health authorities varies considerably from one locale to another depending largely upon consumer awareness and physician interest.

Interstate outbreaks, large intrastate outbreaks, and outbreaks of serious illness such as botulism or mushroom poisoning with species containing amanita toxin are more likely to come to the attention of health authorities, including CDC. The quality of the investigation conducted by state or local health department varies considerably according to the department's interest in foodborne disease outbreaks and its investigative and laboratory capabilities. The likelihood that the findings of the investigation will be reported depends upon a state's commitment to foodborne disease surveillance.

Just as this report should not be the basis of firm conclusions about the absolute incidence of foodborne disease, it should not be used to draw conclusions about the relative incidence of foodborne disease of various etiologies (Table 2). For example, foodborne diseases characterized by short incubation periods such as most outbreaks of chemical etiology or outbreaks caused by Staphylococcus are more likely to be recognized as common-source foodborne disease outbreaks than those diseases with longer incubation periods. The common source aspect of a foodborne outbreak of hepatitis A which typically has an incubation period of several weeks would be particularly likely to escape detection. Outbreaks of serious disease such as botulism or mushroom poisoning with species of mushrooms containing amanita toxin are probably more likely to be reported than less serious illnesses but, because of their rarity, they may be less likely to be recognized and diagnosed. Outbreaks of C. perfringens are recognized readily but confirmed with difficulty because of problems involved in the transport and culturing of anaerobic specimens. Outbreaks of B. cereus, E. coli, V. parahaemolyticus, and Y. enterocolitica are probably less likely to be confirmed because these organisms are less often considered clinically, epidemiologically, and in the laboratory.

The number of reported outbreaks of some etiologies may depend upon the interest of a particular health department or individual. For example, the great increase in the number of reported outbreaks of ciguatera in 1974 probably reflected greater interest in the surveillance of this disease in the states in which they occurred. If a microbiologist becomes interested in looking for C. perfringens, he is likely to confirm more outbreaks of this etiology.

While the relative proportions of reported outbreaks attributed to most etiologies fluctuate minimally from year to year, it is worth noting that a few outbreaks involving very large numbers of persons may vastly alter the relative proportions of cases attributed to various etiologies (Tables 2 and 3).

Information on the number of deaths associated with outbreaks was unreported in 30% of the outbreaks. In many of the others complete information was lacking. Particularly when death is not immediate, foodborne disease may not be appreciated as contributing to the demise of an elderly or debilitated person unable to withstand otherwise minor physical stresses. These limitations on the data must be understood in interpreting Table 4.

In outbreaks of unknown etiology, the accuracy of reported information is always suspect. In these outbreaks when the epidemiology incriminating a particular food item was very weak, the food was listed as unknown in this report (Table 6). Information on the place of acquisition in these outbreaks was judged reliable and recorded (Table 7). However, information on the place where food was mishandled in these outbreaks was generally judged unreliable; in many of them the place of mishandling was listed as unknown (Table 8). Only in outbreaks in which a specific etiology was highly suspected, although unconfirmed in the laboratory, and in which the information on mishandling was consistent with the suspected etiology was a known place of mishandling designated.

The implications of a food-processing establishment mishandling food are great both to the public health and the establishment concerned. Consequently the outbreaks attributed to mishandling at these establishments are thoroughly investigated and reported data carefully scrutinized. For these reasons data obtained in these investigations is considered highly reliable (Tables 8 and 9).

Much is known about contributing factors in foodborne disease. Thus in most outbreaks of botulism and trichinosis, the food is usually inadequately cooked. In most of the outbreaks of bacterial etiology other than botulism and in outbreaks of scombroid (in which bacterial growth is responsible for toxin production), the food is usually stored at improper holding temperatures. In outbreaks of ciguatera, puffer fish poisoning, mushroom poisoning, and paralytic and neurotoxic shellfish poisoning, the food is obtained from an unsafe source, almost by definition. The investigators of foodborne disease outbreaks are usually aware of these contributing factors and consequently seek and find the appropriate factors. Sometimes, however, investigators report factors which are not known to be contributing to outbreaks of the type of etiology confirmed. In such cases the factors are considered in light of the evidence presented; if they are totally unsubstantiated, they are rejected. These considerations must be borne in the mind in interpreting Table 10.

D. <u>Analysis of Data</u>

In 1976 there were 438 outbreaks of foodborne disease involving 12,463 cases, a decrease of 12% in the number of outbreaks reported to the CDC Foodborne Disease Surveillance Activity (Figure 1). An etiology was confirmed in 30% (132) of the outbreaks--similar to the percentage of confirmed outbreaks in 1975 (38%) and in 1974 (44%).

Of the 438 outbreaks, state, local or territorial health departments reported 408 (93%). Outbreaks were reported from 43 states, New York City, District of Columbia, Puerto Rico, Guam, and the Virgin Islands (Figure 2 and Table 1). No outbreaks were reported from 7 states or the Canal Zone. Three outbreaks involved more than 1 state. The 5 state health departments reporting the most outbreaks were Washington (48); Pennsylvania (41), California (26); New York (19); and Hawaii (17). The large number of outbreaks reported from these states undoubtedly reflects the interest of the respective state health departments in foodborne disease surveillance. The 119 outbreaks reported from New York City in 1976 and the 120 reported in 1975 represents a 60-fold increase from 1974, probably reflecting increased reporting.

Of the 132 outbreaks with confirmed etiology, the etiology was bacterial in 92 (70%), chemical in 28 (21%), parasitic in 9 (7%), and viral in 3 (2%) (Table 2). While outbreaks with known bacterial etiology accounted for only 70% of the outbreaks, they accounted for 91% of the cases. The majority of cases of bacterial etiology were caused by <u>Salmonella</u> (33%) and <u>Staphylococcus</u> (26%). The 23 outbreaks and 40 cases of botulism were both the most reported since 1935. The first foodborne outbreak of <u>Yersinia enterocolitica</u> (286 cases) and picornavirus (enterovirus) Echo, type 4 (80 cases) were documented in 1976.

No outbreaks (2 or more cases) of foodborne brucellosis were reported in 1976. However, 24 single cases of brucellosis were attributed to the ingestion of unpasteurized dairy products. Six cases were traced to milk produced in the United States, and 18 were attributed to foreign dairy products. The foreign dairy products included cows' and goats' milk and cheese.

In 1976 there were 10 deaths associated with foodborne outbreaks (Table 4). Most deaths (5) were due to eating food containing the toxin of <u>C. botulinum</u>, a case fatality ratio of 12.5% (5/40). The other 5 deaths (<u>Salmonella</u> 3, <u>Shigella</u> 1, and unknown 1) associated with foodborne outbreaks occurred in elderly persons. Four of the 5 were residents of nursing homes.

Table 5 lists the outbreaks of undetermined etiology by median incubation periods. If one assumes that most outbreaks in which the median incubation period was less than 1 hour were of chemical etiology, that those in which median incubation period was 1-7 hours were of staphylococcal etiology, and that those in which the median incubation period was 8-14 hours were caused by <u>C. perfringens</u> then these agents were responsible for substantially more outbreaks than suggested in Table 2.

The vehicles of transmission were identified in 256 (58%) of the outbreaks (Table 6); multiple vehicles were involved in 30 (6.8%). Of the 226 outbreaks in which a single vehicle was identified, meats or poultry were incriminated in 68 (30%), fish or shellfish in 26 (12%), dairy products in 10 (4%), fruits and vegetables in 6 (3%), salads including chicken, turkey, potato, and egg in 10 (4%), oriental food 19 (8%), mushrooms 1 (1%), and other foods in 64 (28%). Of the meat vehicles beef and ham were most frequently incriminated.

Outbreaks of C. botulinum frequently involved home preserved vegetables and fish (Alaska). C. perfringens outbreaks usually involved beef, and Staphylococcus outbreaks most often involved meat. Salmonella outbreaks were caused by many different vehicles, including meat, such as precooked roast beef, poultry, dairy products, and salads. The outbreaks of heavy metal poisoning all involved nondairy beverages. Ciguatera outbreaks involved mainly coral reef fish (grouper). All the outbreaks of paralytic shellfish poisoning were associated with the consumption of clams. T. spiralis outbreaks involved pork or sausage.

In three-fourths of the outbreaks, the food was eaten at home (24%), in a restaurant (41%), or in a school (5%) (Table 7). Of the 23 outbreaks of botulism, the food was eaten at home in 12 (52%), in a restaurant 1 (4%), and was unknown in 10 (43%). Chemical outbreaks occurred frequently in the home and in food service establishments. Outbreaks caused by parasites usually occurred at home, but hepatitis outbreaks occurred at food service establishments.

The place where the mishandling of the food responsible for an outbreak occurred was specified in 376 outbreaks (Table 8). Of these, food service establishments were specified as responsible for the mishandling of food in 78%, homes in 18%, and food processing establishments in 4%. Food service establishments are locations where food is prepared for public consumption, i.e., restaurants, cafeterias, caterers, hospitals, industrial plants, etc. Food processing establishments are locations where a food is prepared for market. The distribution of places held responsible for mishandling of food in 1976 paralleled that of the 2 previous years. As in 1975 and 1974, where a place of food mishandling was specified, the majority of outbreaks caused by C. perfringens, Salmonella, and Staphylococcus were attributed to mishandling of food in the food service establishments. In ciguatoxin fish poisoning, since there is no practical way to distinguish fish containing ciguatoxin from fish without toxin, and the presence of the toxin is not influenced substantially by the way the fish is handled or cooked, a place of food mishandling was not specified in outbreaks of ciguatera poisoning. In most reported outbreaks of trichinosis, the food handling error occurred in the home while in reported outbreaks of hepatitis, it occurred away from home.

Of the 15 outbreaks attributed to mishandling of food in food processing establishments, 8 were due to bacteria, 5 to chemicals, and 2 were unknown (Table 9).

In 242 (55%) of the 438 outbreaks, including 88 (66%) of the 132 confirmed outbreaks, a contributing factor was reported and accepted in processing data (Table 10). The data reflected patterns of disease causation seen in previous years. In reported outbreaks of botulism and trichinosis, the most frequent error was inadequate cooking of the food. Improper holding temperatures most frequently contributed to reported outbreaks of C. perfringens, Salmonella, and Staphylococcus intoxication. Storage of beverages in metal containers or in contact with tubing of a type which allowed metallic ions to dissolve in the beverage was the most important contributing factor in the outbreaks of heavy metal poisonings. In outbreaks of ciguatera, paralytic shellfish poisoning and mushroom poisoning, the food was unsafe to begin with. In the outbreaks of chemical poisoning caused by miscellaneous chemicals, the food was obtained from an unsafe source. In the 2 outbreaks of hepatitis a person suspected of having active hepatitis was involved in foodhandling.

The date of onset of an outbreak was designated as the date of onset of the first case (Table 11). Generally, outbreaks were distributed more or less equally throughout the year. Outbreaks caused by Salmonella and Staphylococcus tended to occur more frequently in the summer months probably because the warm temperatures allow bacteria to grow in unrefrigerated foods. Outbreaks of paralytic shellfish poisoning tended to occur in the spring and summer months when the growth of toxic dinoflagellates is most abundant.

Fig. 1 FOODBORNE DISEASE OUTBREAKS AND CASES REPORTED TO CENTER FOR DISEASE CONTROL, 1966-1976

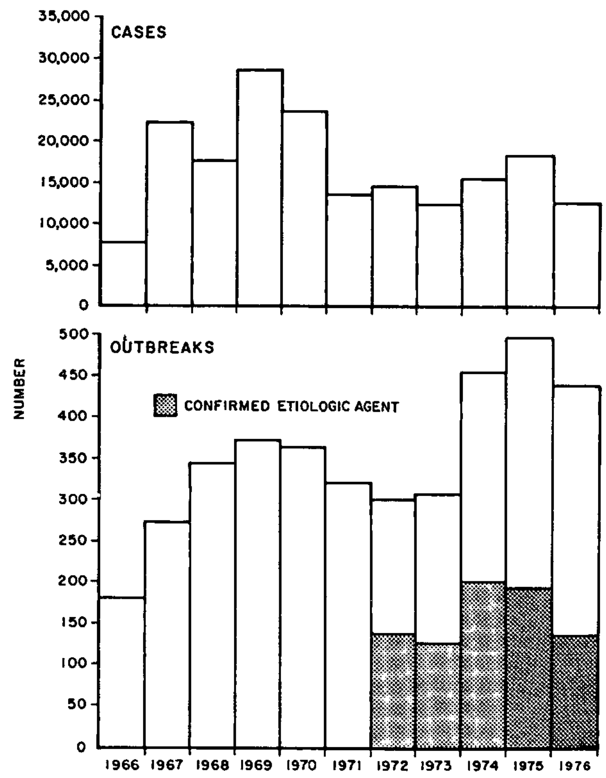

Fig. 2 REPORTED FOODBORNE DISEASE OUTBREAKS, 1976

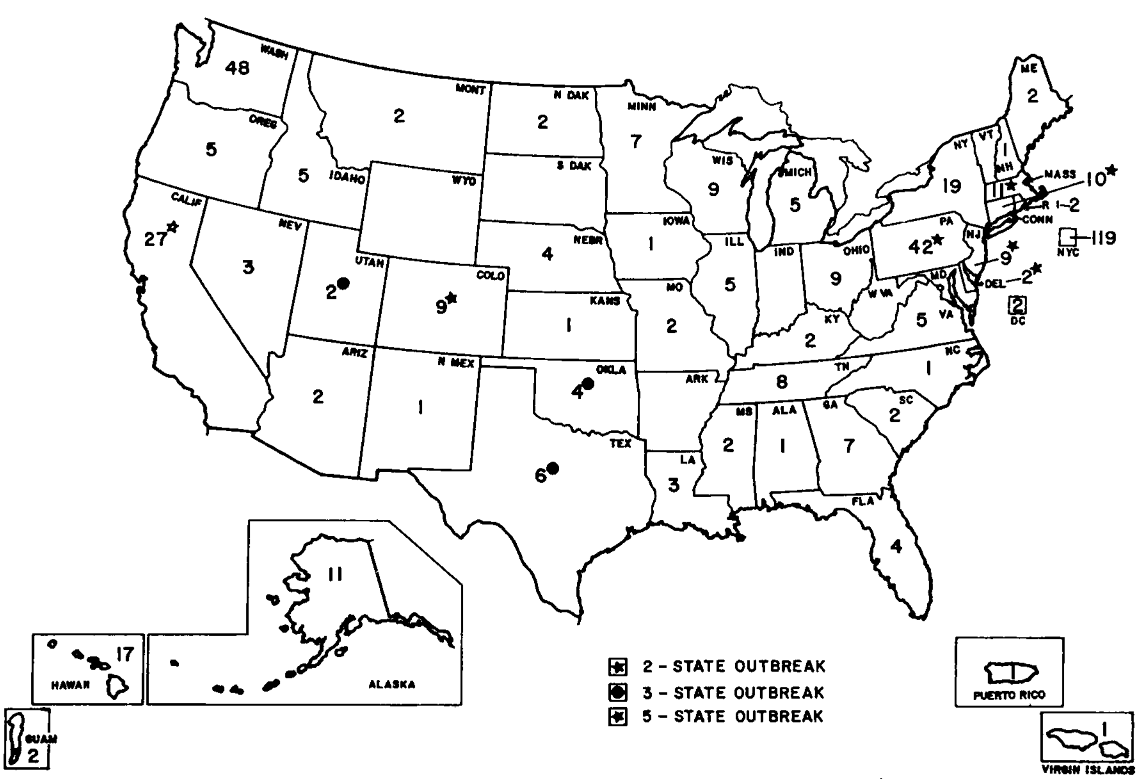

Table 1

Foodborne Disease Outbreaks, by Location, 1974-1976

State	1974	1975	1976	State	1974	1975	1976
Alabama	4	1	1	Missouri	5	8	2
Alaska	5	4	11	Montana	0	3	2
Arizona	5	2	2	Nebraska	5	3	4
Arkansas	4	2	0	Nevada	1	4	3
California	32	41	26	New Hampshire	6	2	1
Colorado	6	1	8	New Jersey	10	12	8
Connecticut	4	9	9	New Mexico	0	1	1
Delaware	0	1	1	New York City	2	120	119
District of Columbia	2	0	2	New York State	22	8	19
Florida	15	30	4	North Carolina	4	0	1
Georgia	11	17	7	North Dakota	0	0	2
Hawaii	27	15	17	Ohio	20	0	9
Idaho	3	0	5	Oklahoma	3	3	3
Illinois	15	12	5	Oregon	8	7	5
Indiana	3	4	0	Pennsylvania	86	21	41
Iowa	4	1	1	Puerto Rico	1	0	1
Kansas	1	0	1	Rhode Island	2	2	2
Kentucky	1	8	2	South Carolina	7	9	2
Louisiana	5	15	3	South Dakota	5	1	0
Maine	0	0	2	Tennessee	6	17	8
Maryland	3	2	0	Texas	5	3	5
Massachusetts	1	8	10	Utah	7	3	1
Michigan	7	5	5	Vermont	2	0	0
Minnesota	14	25	7	Virginia	3	4	5
Mississippi	2	1	2	Washington	49	44	48
Other				West Virginia	6	0	0
Virgin Islands	0	0	1	Wisconsin	8	13	9
				Wyoming	0	1	0
Guam and Trust Territories	4	2	2	Multiple	5	2	3*,**,***
Canal Zone	0	0	0				

*Oklahoma, Texas, Utah
**Connecticut, Delaware, Massachusetts, New Jersey, Pennsylvania
***California, Colorado

1974 total 456
1975 total 497
1976 total 438

Table 2

Confirmed Foodborne Disease Outbreaks and Cases by Etiology, 1976

	Outbreaks		Cases	
	#	%	#	%
BACTERIAL				
B. cereus	2	1.5	63	1.8
C. botulinum	23	17.4	40	1.1
C. perfringens	6	4.5	509	14.2
Salmonella	28	21.2	1169	32.7
Shigella	6	4.5	273	7.6
Staphylococcus	26	19.7	930	26.0
Y. enterocolitica	1	0.8	286	8.0
Total	92	69.6	3,270	91.4
CHEMICAL				
Heavy metal	6	4.5	55	1.5
Ciguatoxin	6	4.5	19	0.5
Scombrotoxin	2	1.5	5	0.1
Paralytic shellfish poison	4	3.0	11	0.3
Monosodium glutamate	2	1.5	7	0.2
Mushroom poison	1	0.8	1	0.0
Other chemicals	7	5.3	59	1.6
Total	28	21.1	157	4.2
PARASITIC				
T. spiralis	8	6.1	27	0.8
E. histolytica	1	0.8	9	0.3
Total	9	6.9	36	1.1
VIRAL				
Hepatitis A	2	1.5	37	1.0
Echo, type 4	1	0.8	80	2.2
Total	3	2.3	117	3.2
CONFIRMED TOTAL	132	99.9	3,580	99.9

Table 3

Confirmed Foodborne Disease Outbreaks and Cases, 1974-1976

	No. of Outbreaks (No. of Cases)		
	1974	1975	1976
BACTERIAL			
A. hinshawii	0(0)	1(15)	0(0)
B. cereus	1(11)	3(45)	2(63)
C. botulinum	21(32)	14(19)	23(40)
C. perfringens	15(863)	16(419)	6(509)
Salmonella	35(5,499)	38(1,573)	28(1,169)
Shigella	3(212)	3(413)	6(273)
Staphylococcus	43(1,565)	45(2,275)	26(930)
Group A *Streptococcus*	1(325)	0(0)	0(0)
V. cholerae	1(6)	0(0)	0(0)
V. parahaemolyticus	0(0)	2(222)	0(0)
Suspect Group D *Streptococcus*	2(38)	1(50)	0(0)
Y. enterocolitica	0(0)	0(0)	1(286)
Total	122(8,551)	123(5,031)	92(3,270)
CHEMICAL			
Heavy metals	4(28)	4(50)	6(55)
Ciguatoxin	26(148)	19(70)	6(19)
Puffer fish tetrodotoxin	1(2)	0(0)	0(0)
Scombrotoxin	10(26)	6(16)	2(5)
Monosodium glutamate	2(4)	3(9)	2(7)
Mushroom poison	6(9)	5(5)	1(1)
Paralytic shellfish poison	1(4)	0(0)	4(11)
Neurotoxic shellfish poison	1(1)	0(0)	0(0)
Miscellaneous chemicals	6(19)	6(38)	7(59)
Total	57(241)	43(188)	28(157)
PARASITIC			
T. spiralis	14(58)	20(193)	8(27)
T. gondii	1(4)	0(0)	0(0)
Anisakidae	1(1)	1(1)	0(0)
D. latum	0(0)	1(1)	0(0)
E. histolytica	0(0)	0(0)	1(9)
Total	16(63)	22(195)	9(36)
VIRAL			
Hepatitis A	6(282)	3(173)	2(37)
Echo, type 4	0(0)	0(0)	1(80)
Total	6(282)	3(173)	3(117)
CONFIRMED TOTAL	201(9,137)	191(5,587)	132(3,580)

Table 4

Deaths Associated with Foodborne Outbreaks, 1974-1976

	1974	1975	1976
C. botulinum	7	2	5
C. perfringens	1	1	0
Salmonella	1	2	3
Shigella	0	0	1
Staphylococcus	0	0	0
V. cholerae	1	0	0
T. spiralis	0	1	0
Hepatitis A	1	0	0
Mushroom poison	0	2	0
Organic chemicals	2	0	0
Unknown	1	2	1
Total	14	10	10

Table 5

Foodborne Disease Outbreaks of Unknown Etiology, by Incubation Period, 1976

Incubation Period	Number of Outbreaks	Percent of Total Outbreaks
<1 hour	24	5.5
1-7 hours	132	30.1
8-14 hours	73	16.7
>15 hours	60	13.7
Unknown	17	3.8
Total	306	69.8

Table 6

Foodborne Disease Outbreaks, by Vehicle of Transmission, and Specific Etiology, 1976

	Beef	Lamb	Ham	Pork	Sausage	Chicken	Turkey	Other Meat	Shellfish	Mahi-Mahi	Other Fish	Milk	Cheese	Ice Cream	Other Dairy Products	Baked Foods	Fruits and Vegetables	Potato Salad	Poultry, Fish, Egg Salad	Other Salads	Mushrooms	Chinese Food	Mexican Food	Non-Dairy Beverages	Multiple Vehicles	Other Foods	Unknown	Total
BACTERIAL																												
B. cereus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2
C. botulinum	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	10	10	23
C. perfringens	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	6
Salmonella	4	-	-	-	-	1	1	-	-	-	-	-	1	1	-	-	-	1	-	-	-	-	1	-	5	4	9	28
Shigella	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	6
Staphylococcus	2	-	3	-	1	2	1	2	-	-	-	-	-	-	-	2	1	1	-	3	-	-	-	-	3	5	-	26
Y. enterocolitica	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CHEMICAL																												
Heavy metal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	1	-	6
Ciguatoxin	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Scombrotoxin	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Paralytic shellfish poison	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Monosodium glutamate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Mushroom poison	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Other chemicals	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	2	-	7
PARASITIC																												
T. spiralis	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	8
E. histolytica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
VIRAL																												
Hepatitis A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Echo, type 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
CONFIRMED TOTAL	9	-	3	3	4	4	3	4	4	1	9	1	2	1	-	3	3	2	-	4	1	-	1	5	10	33	22	132
UNKNOWN	19	-	5	-	1	1	10	2	4	-	8	2	1	1	2	9	3	2	-	2	-	19	4	-	20	31	160	306
TOTAL	28	-	8	3	5	5	13	6	8	1	17	3	3	2	2	12	6	4	-	6	1	19	5	5	30	64	182	438

Table 7

Foodborne Disease Outbreaks, by Place Where Food Was Eaten, and Specific Etiology, 1976

	Home	Restaurant	School	Picnic	Church	Camp	Other or Unknown	Total
BACTERIAL								
B. cereus	–	1	–	–	–	–	1	2
C. botulinum	12	1	–	–	–	–	10	23
C. perfringens	2	1	1	–	–	–	2	6
Salmonella	3	7	2	1	1	1	13	28
Shigella	–	1	–	1	–	–	4	6
Staphylococcus	9	5	2	2	–	–	8	26
Y. enterocolitica	–	–	1	–	–	–	–	1
Total	26	16	6	4	1	1	38	92
CHEMICAL								
Heavy metal	1	3	–	–	1	–	1	6
Ciguatoxin	3	2	–	–	–	–	1	6
Scombrotoxin	2	–	–	–	–	–	–	2
Paralytic shellfish poison	–	–	–	–	–	–	4	4
Monosodium glutamate	–	2	–	–	–	–	–	2
Mushroom poison	1	–	–	–	–	–	–	1
Other chemicals	5	1	–	–	–	–	1	7
Total	12	8	–	–	1	–	7	28
PARASITIC								
T. spiralis	6	–	–	–	–	–	2	8
E. histolytica	–	–	–	–	–	–	1	1
Total	6	–	–	–	–	–	3	9
VIRAL								
Hepatitis A	1	–	–	–	–	–	1	2
Echo, type 4	–	–	–	1	–	–	–	1
Total	1	–	–	1	–	–	1	3
CONFIRMED TOTAL	45	24	6	5	2	1	49	132
UNKNOWN	62	156	18	6	4	1	59	306
Total 1976	107	180	24	11	6	2	108	438
Total 1975	137	196	29	12	16	5	102	497
Total 1974	187	128	23	16	18	6	78	456

Table 8

Foodborne Disease Outbreaks, by Place Where Food Was Mishandled, and Specific Etiology, 1976

	Food Processing Establishments	Food Service Establishments	Homes	Unknown-Unspecified	Not Applicable	Total
BACTERIAL						
B. cereus	-	2	-	-	-	2
C. botulinum	-	-	12	11	-	23
C. perfringens	-	6	-	-	-	6
Salmonella	3	18	4	3	-	28
Shigella	-	5	1	0	-	6
Staphylococcus	4	13	7	2	-	26
Y. enterocolitica	1	-	-	-	-	1
Total (%)	8(8.7)	44(47.8)	24(26.1)	16(17.4)	-	92
CHEMICAL						
Heavy metal	-	3	2	1	-	6
Ciguatoxin	-	-	-	1	5	6
Scombrotoxin	-	-	-	2	-	2
Paralytic shellfish poison	-	-	-	1	3	4
Monosodium glutamate	-	2	-	-	-	2
Mushroom poison	-	-	1	-	-	1
Other chemicals	5	-	2	-	-	7
Total (%)	5(17.9)	5(17.9)	5(17.9)	5(17.9)	8(28.6)	28
PARASITIC						
T. spiralis	-	-	5	3	-	8
E. histolytica	-	1	-	-	-	1
Total (%)	-	1(11.1)	5(55.6)	3(33.3)	-	9
VIRAL						
Hepatitis A	-	2	-	-	-	2
Echo, type 4	-	1	-	-	-	1
Total (%)	-	3(100.0)	-	-	-	3
CONFIRMED TOTAL (%)	13(9.8)	53(40.1)	34(25.8)	24(18.2)	8(6.1)	132
UNKNOWN	2	241	33	29	1	306
Total 1976	15	294	67	53	9	438
Total 1975	13	201	61	222	0	497
Total 1974	16	90	77	273	0	456

Table 9

Foodborne Disease Outbreaks Caused by Mishandling of Food in Food-Processing Establishments 1976

Etiology	Vehicle	Number of Cases
Salmonella heidelberg	Cheese	339
S. bovis-morbificans	Precooked roast beef	21
S. infantis	Nutrient supplement	4
Staphylococcus Enterotoxin D	Greek spaghetti	20
Staphylococcus	Beef ravioli	4
Staphylococcus Enterotoxin D	Custard-filled donuts	2
Staphylococcus	Pepperoni, sausage	3
Y. enterocolitica	Chocolate milk	286
Sodium nitrate	Table salt	2
Propyl paraben	Cake icing	9
Histamine	Cheese	38
Niacin	Hamburger	2
Niacin	Cubed steak	3
Unknown	Tuna extender	508
Unknown	Milk	42

Total	1976	15 outbreaks	1,283 cases
	1975	13 outbreaks	123 cases
	1974	16 outbreaks	1,704 cases

Table 10

Foodborne Disease Outbreaks, by Contributing Factors, and Etiology, 1976

Etiology	Number of Reported Outbreaks	Number of Outbreaks In Which Factors Reported	Improper Holding Temperatures	Inadequate Cooking	Contaminated Equipment	Food From Unsafe Source	Poor Personal Hygiene	Other
BACTERIAL								
B. cereus	2	2	2	-	-	-	-	-
C. botulinum	23	13	3	11	-	-	-	-
C. perfringens	6	6	5	2	1	-	1	1
Salmonella	28	16	10	4	8	3	8	4
Shigella	6	3	1	2	-	-	2	2
Staphylococcus	26	22	20	-	3	1	7	-
Y. enterocolitica	1	-	-	-	-	-	-	-
Total	92	62	41	19	12	4	18	7
CHEMICAL								
Heavy metal	6	6	1	-	3	-	-	2
Ciguatoxin	6	2	-	-	-	1	-	1
Scombrotoxin	2	1	-	-	-	-	-	1
Paralytic shellfish poison	4	3	-	-	-	3	-	-
Monosodium glutamate	2	0	-	-	-	-	-	-
Mushroom poison	1	1	-	-	-	1	-	-
Other chemicals	7	5	-	-	-	2	-	3
Total	28	18	1	-	3	7	-	7
PARASITIC								
T. spiralis	8	7	-	7	-	-	-	-
E. histolytica	1	-	-	-	-	-	-	-
Total	9	7	-	7	-	-	-	-
VIRAL								
Hepatitis A	2	1	-	-	-	-	1	-
Echo, type 4	1	-	-	-	-	-	-	-
Total	3	1	-	-	-	-	1	-
CONFIRMED TOTAL	132	88	42	26	15	11	19	14
UNKNOWN	306	154	118	17	39	6	34	30
Total 1976	438	242	160	43	54	17	53	44
Total 1975	497	277	214	87	62	14	93	14
Total 1974	456	219	131	45	31	50	41	9

Table 11

Foodborne Disease Outbreaks, by Month of Occurrence, and Specific Etiology, 1976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BACTERIAL													
B. cereus	-	-	-	-	1	1	-	-	-	-	-	-	2
C. botulinum	2	1	4	2	-	-	2	-	6	1	3	2	23
C. perfringens	1	-	1	2	-	-	1	1	-	-	-	-	6
Salmonella	1	-	-	-	3	6	5	3	5	2	2	1	28
Shigella	-	-	-	1	-	1	1	1	-	-	1	1†	6
Staphylococcus	1	2	1	3	3	2	4	4	5	-	1	-	26
Y. enterocolitica	-	-	-	-	-	-	-	-	1	-	-	-	1
Total	5	3	6	8	7	10	13	9	17	3	7	4	92
CHEMICAL													
Heavy metal	-	1	-	2	-	1	2	-	-	-	-	-	6
Ciguatoxin	1	-	-	-	2	1	-	-	-	1	1	-	6
Scombrotoxin	-	-	-	-	-	1	-	-	-	1	-	-	2
Paralytic shellfish poison	-	-	-	-	1	1	2	-	-	-	-	-	4
Monosodium glutamate	-	-	1	-	-	-	-	-	-	1	-	-	2
Mushroom poison	-	-	-	-	1	-	-	-	-	-	-	-	1
Other chemicals	1	-	-	1	1	2	1	-	-	-	-	-	6*
Total	2	1	1	3	5	6	5	-	-	3	1	-	27
PARASITIC													
T. spiralis	-	1	3	-	-	1	-	1	-	-	2	-	8
E. histolytica	-	-	-	-	1	-	-	-	-	-	-	-	1
Total	-	1	3	-	1	1	-	1	-	-	2	-	9
VIRAL													
Hepatitis A	-	-	-	-	1	-	-	-	1	-	-	-	2
Echo, type 4	-	-	-	-	-	-	1	-	-	-	-	-	1
Total	-	-	-	-	1	-	1	-	1	-	-	-	3
CONFIRMED TOTAL	7	5	10	11	14	17	19	10	18	6	10	4	131
UNKNOWN	33	14	18	37	31	24	22	33	14	23	38	19	306
Total 1976	40	19	28	48	45	41	41	43	32	29	48	23	437
Total 1975	39	39	35	41	66	41	48	36	33	42	31	40	491**
Total 1974	33	21	37	33	44	42	41	43	43	39	46	29	451

*Month of occurrence not known in 1 chemical outbreaks (Niacin)
**Month of occurrence not known in 6 outbreaks of unknown etiology
†Delayed entry, occurred December 1975

This report is authorized by law (Public Health Service Act, 42 USC 241) and is also recommended by the Conference of State and Territorial Epidemiologists. While your response is voluntary, your cooperation is necessary for the understanding and control of the diseases.

FORM APPROVED
OMB NO. 68-R557

E. INVESTIGATION OF A FOODBORNE OUTBREAK

1. Where did the outbreak occur?
State ____________ (1,2) City or Town ____________ County ____________

2. Date of outbreak: (Date of onset 1st case)
____________ (3-8)

3. Indicate actual (a) or estimated (e) numbers:
Persons exposed ____________ (9-11)
Persons ill ____________ (12-14)
Hospitalized ____________ (15-16)
Fatal cases ____________ (17)

4. History of Exposed Persons:
No. histories obtained ____________ (18-20)
No. persons with symptoms ____________ (21-23)
Nausea ______ (24-26) Diarrhea ______ (33-35)
Vomiting ______ (27-29) Fever ______ (36-38)
Cramps ______ (30-32) Other, specify ______
____________ (39)

5. Incubation period (hours):
Shortest ______ (40-42) Longest ______ (43-45)
Approx. for majority ____________ (46-48)

6. Duration of Illness (hours):
Shortest ______ (49-51) Longest ______ (52-54)
Approx. for majority ____________ (55-57)

7. Food-specific attack rates: (58)

Food Items Served	Number of persons who ATE specified food				Number who did NOT eat specified food			
	Ill	Not Ill	Total	Percent Ill	Ill	Not Ill	Total	Percent Ill

8. Vehicle responsible (food item incriminated by epidemiological evidence): (59,60) ____________

9. Manner in which incriminated food was marketed: (Check all applicable)

(a) Food Industry (61)
Raw ☐ 1
Processed ☐ 2
Home Produced
Raw ☐ 3
Processed ☐ 4

(b) Vending Machine ☐ 1 (62)

(c) Not wrapped ☐ 1 (63)
Ordinary Wrapping ☐ 2
Canned ☐ 3
Canned–Vacuum Sealed ☐ 4
Other (specify) ☐ 5
____

(d) Room Temperature ☐ 1 (64)
Refrigerated ☐ 2
Frozen ☐ 3
Heated ☐ 4

If a commercial product, indicate brand name and lot number
____

10. Place of Preparation of Contaminated Item: (65)
Restaurant ☐ 1
Delicatessen ☐ 2
Cafeteria ☐ 3
Private Home ☐ 4
Caterer ☐ 5
Institution:
School ☐ 6
Church ☐ 7
Camp ☐ 8
Other, specify ☐ 9
____
____

11. Place where eaten: (66)
Restaurant ☐ 1
Delicatessen ☐ 2
Cafeteria ☐ 3
Private Home ☐ 4
Picnic ☐ 5
Institution:
School ☐ 6
Church ☐ 7
Camp ☐ 8
Other, specify ☐ 9
____
____

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
BUREAU OF EPIDEMIOLOGY
ATLANTA, GEORGIA 30333

CDC 4.245
1-74

(Over)

LABORATORY FINDINGS (Include Negative Results)

12. Food specimens examined: (67)
Specify by "X" whether food examined was original (eaten at time of outbreak) or check-up (prepared in similar manner but not involved in outbreak)

Item	Orig.	Check up	Findings Qualitative	Findings Quantitative
Example: beef	X		C. perfringens, Hobbs type 10	2×10^6/gm

13. Environmental specimens examined: (68)

Item	Findings
Example: meat grinder	C. perfringens, Hobbs Type 10

14. Specimens from patients examined (stool, vomitus, etc.): (69)

Item	No. Persons	Findings
Example: stool	11	C. perfringens, Hobbs Type 10

15. Specimens from food handlers (stool, lesions, etc.): (70)

Item	Findings
Example: lesion	C. perfringens, Hobbs type 10

16. Factors contributing to outbreak (check all applicable)

	Yes	No	
1. Improper storage or holding temperature	☐ 1	☐ 2	(71)
2. Inadequate cooking	☐ 1	☐ 2	(72)
3. Contaminated equipment or working surfaces	☐ 1	☐ 2	(73)
4. Food obtained from unsafe source	☐ 1	☐ 2	(74)
5. Poor personal hygiene of food handler	☐ 1	☐ 2	(75)
6. Other, specify ________	☐ 1	☐ 2	(76)

17. Etiology: (77, 78)
Pathogen ____________________
Chemical ____________________
Other ____________________

Suspected ☐ 1 (79)
Confirmed ☐ 2
Unknown ☐ 3

18. Remarks: Briefly describe aspects of the investigation not covered above, such as unusual age or sex distribution; unusual circumstances leading to contamination of food, water; epidemic curve; etc. (Attach additional page if necessary)

Name of reporting agency: (80)

Investigating official: | Date of investigation:

NOTE: Epidemic and Laboratory Assistance for the investigation of a foodborne outbreak is available upon request by the State Health Department to the Center for Disease Control, Atlanta, Georgia 30333.

To improve national surveillance, please send a copy of this report to:

Center for Disease Control
Attn: Enteric Diseases Branch, Bacterial Diseases Division
Bureau of Epidemiology
Atlanta, Georgia 30333

Submitted copies should include as much information as possible, but the completion of every item is not required.

CDC 4.245 (BACK)
1-74

F. LINE LISTING OF FOODBORNE DISEASE OUTBREAKS

1976

F. LINE LISTING OF FOODBORNE DISEASE OUTBREAKS, 1976

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
BACTERIAL								
BACILLUS CEREUS								
B. cereus	New York	8	6-18		+		Pork fried rice	(B) restaurant
B. cereus	Wisconsin	55	5-6		+		Chicken stew	(B) cafeteria
CLOSTRIDIUM BOTULINUM								
C. botulinum, type E	Alaska	1	1-4	+	+		White fish	(C) home
C. botulinum, type E	Alaska	8	7-7	+	+		Fishheads, fish eggs	(C) home
C. botulinum, type A	Alaska	3	9-8		+		Fish eggs	(C) home
C. botulinum, type B	Alaska	2	12-23	+	+		Salted salmon	(C) home
C. botulinum, type A	California	1	3-27	+			Unknown	(D) unknown
C. botulinum, type A	California	1	9-2	+			Unknown	(D) unknown
C. botulinum, type A	California	1	12-20	+	+		Beef pot pie	(C) home
C. botulinum, type B	Connecticut	1	10-14	+			Unknown	(D) unknown
C. botulinum, type B	Michigan	1	3-1	+	+		Vegetable & sausage mixture	(C) home
C. botulinum, type unknown	Minnesota	1	4-22				Unknown	(D) unknown
C. botulinum, type unknown	Montana	1	3-16				Unknown	(D) unknown

C. botulinum, type unknown	New Mexico	1	7-4			Green beans	(C) home
C. botulinum, type D	North Carolina	1	11-29	+		Tomato juice	(C) home
C. botulinum, type B	Ohio	1	9-12	+	+	Corn	(C) home
C. botulinum, type A	Ohio	1	9-16	+		Carrots	(C) home
C. botulinum, type unknown	Oregon	1	9-12	+		Unknown	(D) unknown
C. botulinum, type B	Tennessee	1	11-27	+		Unknown	(D) unknown
C. botulinum, type B	Virginia	1	2-7	+		Unknown	(D) unknown
C. botulinum, type A	Washington	2	1-3	+	+	Eels	(C) home
C. botulinum, type A	Washington	1	3-7	+		Unknown	(D) unknown
C. botulinum, type unknown	Washington	1	9-17			Asparagus	(C) home
C. botulinum, type A	Wisconsin	1	11-10	+		Unknown	(D) unknown
C. botulinum, type unknown	Oklahoma, Utah, Texas	7	4-14			Cherry peppers	(D) restaurant
CLOSTRIDIUM PERFRINGENS							
C. perfringens, Hobbs type 1	Illinois	4	8-22	+	+	Prime rib	(B) restaurant
C. perfringens	New Jersey	125	4-3		+	Roast beef, gravy	(B) school
C. perfringens, CDC type, PS 16	New York	217	7-11	+	+	Turkey	(B) camp cafeteria
C. perfringens	Utah	8	4-26	+	+	Beef & gravy	(B) home

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* and Eaten
C. perfringens	Wisconsin	5	1-25		+		Gravy	(B) home
C. perfringens, Hobbs types 3, 4, & PS 52	Wisconsin	150	3-7	+			Bread & gravy	(B) cafeteria
SALMONELLA								
_S._, group E, species unknown	California	73	5-22	+	+	+	Turkey, dressing, squash	(B) banquet room
S. heidelberg	California	7	5-?	+		+	Mexican food	(B) restaurant
S. typhimurium	California	12	11-8	+			Unknown	(B) social hall - mobile home park
S. heidelberg	Colorado	339	7-23	+	+		Cheese	(A) restaurant
S. typhimurium, _S. give_	Connecticut	3	11-15	+		+	Unknown	(B) restaurant
S. typhi	Florida	8	6-15	+		+	Peruvian cheese & potato dish	(C) dress factory
S. heidelberg	Maine	78	7-4	+			Bread stuffing, gravy, corn, Apple Betty, & topping	(B) resort inn
S. typhimurium	Maine	24	9-22	+			Unknown	(B) school
S. newport	Massachusetts	9	6-?	+	+		Roast beef	(D) home
S. muenchen	Massachusetts	35	6-?	+		+	Unknown	(D) wedding reception
S. typhimurium	Massachusetts	48	10-5	+		+	Unknown	(B) nursing home

S. typhimurium	Michigan	7	7-5	+	+		Ice cream	(C) home
S. london	Minnesota	37	6-4	+	+	+	Prime rib, roast beef, ham	(B) restaurant
S. thompson	Missouri	15	9-7	+	+		Tuna & macaroni salads	(B) hospital
S. typhimurium	New Hampshire	44	7-5	+		+	Unknown	(D) nursing home, jail
S. san-diego	New Jersey	2	7-8	+	+	+	Corned beef	(B) home
S. typhimurium	New Jersey	18	9-19	+	+	+	Chicken casserole	(C) church
S. saint-paul	New York	54	8-26	+		+	Turkey	(B) camp
S. copenhagen	Oklahoma	29	5-27	+	+		Salad dressing	(B) restaurant
S. heidelberg, S. schwarzengrund	Pennsylvania	17	6-21	+			Unknown	(B) mental institution
S. saint-paul, S. typhimurium	Pennsylvania	42	9-28	+		+	Potato salad	(B) restaurant
S. blockley	Washington	58	6-12	+			Unknown	(B) nursing home
S. typhimurium	Washington	27	8-8	+			Potato salad, macaroni salad	(C) picnic
S. heidelberg	Washington	24	10-16	+			Unknown	(B) cafeteria
S. typhimurium	Wisconsin	119	1-15	+		+	Roast beef	(B) school
S. enteritidis	New York City	15	9-24	+		+	Japanese food	(B) restaurant
S. bovis morbificans	Connecticut, Delaware, Massachusetts, New Jersey, Pennsylvania	21	8-?	+			Precooked roast beef	(A) restaurant & deli

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable

Etiology	State	Number of Cases	Date of Onset	Patient	Vehicle	Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
S. infantis	California, Colorado	4	12-?	+	+		Nutrient supplement	(A) hospital
SHIGELLA								
S. flexneri 3A **	California	46	12-22-75	+			Unknown	(B) hotel
S., species unknown	Colorado	12	4-26	+		+	Fruit compote	(B) sorority house
S. sonnei	Massachusetts	5	8-13	+			Chopped liver	(B) restaurant
S. boydii	Texas	176	11-5	+		+	Spaghetti	(B) military mess hall
S. flexneri 2	Washington	13	6-27	+		+	Polynesian food	(B) youth center
S. sonnei	Washington	21	7-31	+			Tossed salad	(C) picnic
STAPHYLOCOCCUS								
S. aureus	California	2	2-3		+		Hamburger	(B) restaurant
S. aureus, enterotoxin A, B, & D	California	4	6-15		+		Macaroni salad	(B) restaurant
S. aureus, 85, enterotoxin D	Colorado	20	7-20	+	+	+	Greek spaghetti	(A) office
S. aureus	Colorado	5	9-6		+		Ham	(C) home
S. aureus, enterotoxin A	Georgia	13	3-31		+		Turkey, dressing, gravy	(C) civic center
S. aureus	Hawaii	9	4-28		+		Chicken	(D) home
S. aureus	Hawaii	3	11-4		+		Cooked laulau	(C) home
S. aureus	Idaho	14	8-17		+		Macaroni & cheese with hot dogs	(B) day-care center

S. aureus, 83A	Illinois	324	2-9	+	+	+	Turkey salad	(B) school
S. aureus, 6/47/53/-54/75/+	Iowa	13	9-28		+	+	Liver paté	(B) restaurant
S. aureus	Louisiana	20	5-14		+		Prime rib	(B) convention center
S. aureus	Louisiana	15	8-10		+		Ham, beans	(B) fire station
S. aureus	Nevada	3	7-15		+		Shrimp salad	(B) restaurant
S. aureus	New York	4	7-?		+		Beef ravioli	(A) home
S. aureus, enterotoxin D	New York	2	9-6		+		Custard-filled donuts	(A) home
S. aureus	North Dakota	35	5-31		+		Ham	(C) picnic
S. aureus	Ohio	8	4-20		+		Ham	(C) highway rest stop
S. aureus, 6/42E/47/-53/54/75/83A/84/81/+	Pennsylvania	3	1-16	+	+	+	Coconut custard pie	(B) home
S. aureus	Pennsylvania	3	4-23		+		Potato salad	(C) picnic
S. aureus	Pennsylvania	50	6-30		+		Turkey salad	(B) drug-alcohol rehabilitation center
S. aureus	Pennsylvania	12	8-10		+		Chicken	(D) meeting hall
S. aureus	Tennessee	3	7-30	+	+		Barbecue	(B) restaurant
S. aureus, enterotoxin D	Tennessee	22	9-11		+		Baked beans	(B) home
S. aureus	Washington	3	8-4		+		Pepperoni, sausage	(A) home

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable
**Delayed entry--occurred 12-22-75

Etiology	State	Number of Cases	Date of Onset	Lab Data			Vehicle	Location Where Food Mishandled* And Eaten
				Patient	Vehicle	Food-handler		
S. aureus, 1136	Washington	336	9-24		+	+	Club salad (macaroni)	(B) school
S. aureus, enterotoxin A & D	Wisconsin	4	5-12		+		Polish sausage	(C) home
YERSINIA ENTEROCOLITICA								
Y. enterocolitica	New York	286	9-18	+	+		Chocolate milk	(A) school
CHEMICAL								
Copper	Michigan	11	4-18		+		Cherry flavored soft drink	(C) church
Copper	New York	14	6-15		+		Apple cider	(D) school picnic
Cadmium	South Carolina	5	4-25		+		Apple pancakes	(C) home
Copper	New York City	2	2-25		+		Cola	(B) restaurant
Copper	New York City	20	7-21		+		Fruit punch	(B) restaurant
Copper	New York City	3	7-29		+		Soda	(B) restaurant
Ciguatoxin	Florida	2	5-?				Grouper	(E) home
Ciguatoxin	Florida	1	6-21				Grouper	(E) restaurant
Ciguatoxin	Hawaii	4	10-23				Jack Fish	(E) unknown
Ciguatoxin	Hawaii	2	11-18				Surgeon Fish	(E) home
Ciguatoxin	Virgin Island	7	1-?				Amberjack	(E) restaurant
Ciguatoxin	Puerto Rico	3	5-18				Red Snapper	(E) home

Scombrotoxin	California	1	6-1	+	Tuna	(D) restaurant
Scombrotoxin	Colorado	4	10-1	+	Mahi-Mahi	(D) restaurant
Paralytic shellfish poisoning	Alaska	4	5-20		Clams	(E) unknown
Paralytic shellfish poisoning	Alaska	2	6-30		Clams	(E) unknown
Paralytic shellfish poisoning	Alaska	1	7-14	+	Clams	(E) ship
Paralytic shellfish poisoning	Alaska	4	7-18	+	Clams	(E) ship
Monosodium glutamate	Hawaii	3	3-6	+	Scallop soup	(B) restaurant
Monosodium glutamate	Hawaii	4	10-4	+	Won Ton Mien	(B) restaurant
Mushroom poison	Washington	1	5-21	+	Amanita panther-ina	(C) home
Sodium nitrate	California	2	6-3	+	Table salt	(A) home
Phytolacca americana (poke weed)	Oklahoma	4	5-4	+	Green salad	(C) home
Propyl paraben	Virginia	9	6-7	+	Cake icing	(A) business office
Burdock root	Washington	1	7-26		Burdock root	(C) home
Histamine	Washington	38	1-?	+	Cheese	(A) restaurant
Niacin	New York City	2	4-19	+	Hamburger	(A) home
Niacin	New York City	3	?-?	+	Cubed steak	(A) home

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
PARASITIC								
TRICHINELLA SPIRALIS								
T. spiralis	Alaska	4	3-?	+			Walrus meat	(C) home
T. spiralis	California	5	6-21	+			Pork	(D) workshop
T. spiralis	California	5	8-?	+			Pork	(C) home
T. spiralis	Massachusetts	5	11-?	+			Pork	(D) unknown
T. spiralis	Pennsylvania	2	2-?	+	+		Pork sausage, pork steak	(C) home
T. spiralis	Pennsylvania	2	3-?	+	+		Pork sausage	(C) home
T. spiralis	Pennsylvania	2	3-?	+	+		Pork sausage	(D) home
T. spiralis	Pennsylvania	2	11-5	+	+		Pork sausage	(C) home
ENTAMOEBA HISTOLYTICA								
E. histolytica	Colorado	9	5-11	+			Salad	(B) fraternity house
VIRAL								
Hepatitis A	Georgia	26	9-3	+		+	Unknown	(B) commune
Hepatitis A	Pennsylvania	11	5-3	+			Unknown	(B) restaurant
Echo, type 4	Pennsylvania	80	7-5	+			Cole slaw	(B) picnic
UNKNOWN								
	Alabama	226	10-7				Potatoes, meat sauce	(B) school

Alaska	150	5-10	Meatballs	(B) restaurant
Alaska	39	11-17	Unknown	(B) school
Arizona	12	1-12	Unknown	(B) drug rehabilitation institution
Arizona	110	10-26	Hot turkey sandwich, mashed potatoes & gravy	(B) school
California	19	3-6	Unknown	(B) restaurant
California	28	5-15	Unknown	(C) home
California	18	6-13	Unknown	(B) dining hall
California	23	6-20	Unknown	(C) home
California	3	7-1	Unknown	(C) home
California	2	8-14	Unknown	(C) home
California	508	8-26	Tuna extender	(A) unknown
California	37	8-31	Unknown	(B) cafeteria
California	6	10-6	Unknown	(B) home
California	3	11-2	Unknown	(B) restaurant
California	8	11-4	Beef	(D) restaurant
California	29	12-4	Unknown	(B) restaurant
California	2	12-30	Turkey	(B) home

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	Colorado	2	7-14				Unknown	(B) restaurant
	Colorado	70	12-3				Unknown	(D) country club
	Connecticut	5	10-17				Unknown	(D) unknown
	Connecticut	8	10-29				Macaroni & cheese	(B) cafeteria
	Connecticut	100	10-30				Unknown	(B) wedding banquet
	Connecticut	125	11-11				Turkey	(B) school
	Connecticut	4	11-29				Oriental food	(B) restaurant
	Connecticut	90	11-30				Unknown	(D) women's group luncheon
	Connecticut	3	12-9				Pizza	(B) home
	Delaware	79	11-8				Spaghetti	(B) school
	District of Columbia	25	11-25				Turkey	(B) women's club
	District of Columbia	21	12-3				Mixed vegetables	(B) school
	Florida	3	5-?				Snapper	(E) home
	Georgia	3	2-6				Unknown	(B) restaurant
	Georgia	2	8-5				Unknown	(B) restaurant
	Georgia	2	8-23				Unknown	(C) home

Georgia	350	9-16	Beef stew	(B) correctional institution
Georgia	11	12-5	Unknown	(B) country club
Hawaii	3	2-24	Mullet	(D) home
Hawaii	3	3-28	Noodles	(D) home
Hawaii	36	4-9	Oyster	(B) restaurant
Hawaii	6	4-16	Unknown	(B) home
Hawaii	9	4-18	Raw clams	(B) home
Hawaii	92	7-3	Roast duck with plum sauce, oyster rolls	(B) restaurant
Hawaii	11	8-13	Unknown	(B) restaurant
Hawaii	150	8-21	Unknown	(B) restaurant
Hawaii	4	11-16	White fish	(D) home
Hawaii	20	11-18	Sausage	(B) restaurant
Hawaii	2	11-18	Baked fish	(D) home
Idaho	590	6-19	Potato salad	(B) local park
Idaho	12	8-15	Unknown	(B) restaurant
Idaho	25	10-8	Unknown	(B) restaurant
Idaho	4	11-29	Turkey	(C) home
Illinois	35	1-3	Unknown	(B) wedding party dinner

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	Illinois	9	1-7				Ham	(C) home
	Illinois	27	4-21				Unknown	(B) restaurant
	Kansas	3	11-4				Tuna salad	(B) truck
	Kentucky	7	8-28				Chicken with gravy, dressing	(B) cafeteria
	Kentucky	38	10-4				Unknown	(D) club
	Louisiana	33	8-20				Tossed salad, crab meat cocktail, cornish hen	(B) hospital dining room
	Massachusetts	14	5-18				Ham	(B) school
	Massachusetts	38	9-?				Unknown	(B) nursing home
	Massachusetts	43	10-24				Roast beef & gravy	(B) school
	Massachusetts	61	10-?				Unknown	(B) mental health facility
	Massachusetts	117	11-?				Unknown	(B) restaurant
	Michigan	5	6-3				Beef	(B) restaurant
	Michigan	66	7-?				Roast beef	(B) nursing home
	Minnesota	4	4-5				Unknown	(B) home
	Minnesota	3	4-6				Unknown	(C) home

Minnesota	7	4-18	Unknown	(C) home
Minnesota	16	4-28	Unknown	(B) school
Minnesota	7	10-15	Unknown	(D) restaurant
Mississippi	50	4-24	Unknown	(B) cafeteria
Mississippi	58	12-21	Turkey, dressing	(B) plant
Missouri	30	4-10	Tuna salad	(B) fraternity house
Montana	15	12-22	Unknown	(B) restaurant
Nebraska	3	6-23	Beets	(B) restaurant
Nebraska	97	11-9	Unknown	(B) hotel
Nebraska	2	11-21	Unknown	(B) restaurant
Nebraska	6	11-28	Unknown	(B) restaurant
Nevada	4	4-28	Unknown	(B) home
Nevada	10	12-5	Chinese food	(B) home
New Jersey	58	1-3	Unknown	(B) nursing home
New Jersey	125	1-13	Turkey, gravy	(B) school
New Jersey	26	4-24	Fried rice	(B) restaurant
New Jersey	55	6-17	Chicken, vegetables	(B) motel
New Jersey	240	10-3	Unknown	(B) fire house
New York	22	1-11	Hamburger with sauce	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	New York	30	2-1				Salad	(B) restaurant
	New York	3	4-13				Fudge cake	(B) home
	New York	34	5-12				Unknown	(B) restaurant
	New York	29	5-12				Unknown	(B) restaurant
	New York	63	5-12				Unknown	(B) restaurant
	New York	17	5-16				Unknown	(B) home
	New York	10	7-13				Unknown	(D) picnic
	New York	13	7-15				Unknown	(B) nursing home-hospital
	New York	124	10-11				Hamburger, roast beef, turkey, veal	(B) school
	New York	34	11-1				Unknown	(B) wedding reception
	New York	114	11-13				Tuna salad, carrot salad, pickles	(B) restaurant
	North Dakota	125	1-31				Oriental food	(C) church
	Ohio	34	3-13				Unknown	(B) hotel
	Ohio	2	3-21				Unknown	(B) restaurant
	Ohio	40	7-13				Unknown	(B) motel restaurant

Ohio	24	8-13	Beef & macaroni casserole	(B) summer camp
Ohio	105	11-16	Gravy	(B) restaurant
Ohio	244	12-11	Cherries jubilee	(B) hotel banquet room
Oklahoma	9	7-27	Unknown	(B) officer's club
Oregon	2	3-6	Unknown	(C) home
Oregon	9	6-6	Turkey	(B) school
Oregon	8	7-19	Unknown	(B) picnic
Oregon	13	12-31	Unknown	(B) restaurant
Pennsylvania	2	1-19	Unknown	(D) home
Pennsylvania	4	1-31	Chinese food	(B) restaurant
Pennsylvania	41	2-4	Potato salad, macaroni salad	(B) restaurant
Pennsylvania	23	2-8	Unknown	(C) camp
Pennsylvania	2	2-18	Unknown	(B) home
Pennsylvania	5	3-7	Hero sandwich	(B) restaurant
Pennsylvania	42	3-11	Milk	(A) school
Pennsylvania	2	3-22	Unknown	(B) movie theater
Pennsylvania	2	3-30	Unknown	(B) restaurant
Pennsylvania	30	4-3	Unknown	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	Pennsylvania	2	4-16				Unknown	(B) restaurant
	Pennsylvania	30	4-25				Unknown	(B) country club
	Pennsylvania	3	5-3				Unknown	(B) home
	Pennsylvania	3	5-9				Unknown	(C) home
	Pennsylvania	100	5-22				Unknown	(D) wedding reception
	Pennsylvania	24	5-31				Meatballs	(C) block party
	Pennsylvania	29	6-18				Unknown	(B) country club
	Pennsylvania	4	7-3				Unknown	(B) restaurant
	Pennsylvania	10	7-21				Unknown	(B) restaurant
	Pennsylvania	150	7-25				Unknown	(B) restaurant
	Pennsylvania	12	7-27				Unknown	(B) restaurant
	Pennsylvania	2	7-?				Cheese topping on pizza	(B) pizza parlor
	Pennsylvania	4	8-20				Unknown	(D) home
	Pennsylvania	5	8-?				Cake	(C) home
	Pennsylvania	63	9-6				Unknown	(B) school
	Pennsylvania	48	10-30				Submarine sandwich	(B) school & factory
	Pennsylvania	50	11-7				Unknown	(B) restaurant
	Pennsylvania	23	11-20				Unknown	(B) restaurant

Pennsylvania	25	12-13	Unknown	(D) lodge
Rhode Island	8	6-25	American goulash	(C) automobile
Rhode Island	45	6-27	Turkey dressing	(D) church
South Carolina	2	2-20	Unknown	(B) home
Tennessee	100	1-8	Unknown	(B) hotel
Tennessee	2	4-20	Unknown	(B) restaurant
Tennessee	2	7-27	Tuna salad	(C) home
Tennessee	2	10-5	Barbecue	(B) home
Tennessee	120	10-19	Tuna, peas, carrots	(B) school
Texas	29	5-8	Potato salad	(C) picnic
Texas	950	5-11	Beef tacos	(B) school
Texas	30	5-22	Shrimp, raw crab	(B) restaurant
Texas	150	11-2	Corn	(B) prison
Virginia	14	4-19	Unknown	(C) home
Virginia	12	7-15	Ham	(B) military mess hall
Virginia	4	8-26	Turkey sandwich	(B) correctional road camp
Washington	4	1-4	Unknown	(C) home
Washington	4	1-8	Unknown	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	Washington	2	1-9				Omelet, pickled corn, cauliflower	(B) restaurant
	Washington	5	2-22				Unknown	(B) restaurant
	Washington	9	2-29				Unknown	(B) restaurant
	Washington	11	3-26				Unknown	(B) restaurant
	Washington	5	3-28				Turkey á la King	(B) restaurant
	Washington	5	4-4				Ground beef	(B) restaurant
	Washington	2	4-4				Turkey sandwich with gravy	(B) restaurant
	Washington	3	4-11				Roast beef	(B) restaurant
	Washington	2	4-13				Ground beef	(B) restaurant
	Washington	47	5-1				Unknown	(D) restaurant
	Washington	4	5-14				Unknown	(B) restaurant
	Washington	2	5-17				Unknown	(B) restaurant
	Washington	7	5-23				Chicken, deviled eggs	(D) picnic
	Washington	3	6-1				Fried fish	(D) restaurant
	Washington	2	6-10				Beef enchilada	(B) restaurant
	Washington	4	6-21				Chinese food	(B) restaurant

Washington	11	6-29	Sirloin tips in gravy	(B) restaurant
Washington	5	7-8	Pizza	(B) restaurant
Washington	3	7-28	Relano with ground beef & refried beans	(B) restaurant
Washington	3	8-5	Chinese food	(B) restaurant
Washington	8	8-6	Barbecue chicken, potato salad	(B) restaurant
Washington	8	8-9	Chinese food	(B) restaurant
Washington	3	8-13	Unknown	(B) home
Washington	8	8-15	Unknown	(B) restaurant
Washington	17	8-15	Roast beef	(C) picnic
Washington	5	9-5	Kippered salmon	(D) home
Washington	3	9-11	Mexican food	(B) restaurant
Washington	4	9-13	Chicken, potato salad, deviled eggs	(C) picnic
Washington	4	9-16	Ground beef	(B) restaurant
Washington	11	9-?	Hollandaise sauce	(B) restaurant
Washington	7	10-23	Pizza	(B) restaurant
Washington	7	11-21	Taco meat	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data			Vehicle	Location Where Food Mishandled* And Eaten
				Patient	Vehicle	Food-handler		
(UNKNOWN)	Washington	6	12-18				Turkey with gravy	(B) restaurant
	Wisconsin	2	6-26				Root beer	(B) automobile
	Wisconsin	50	8-26				Roast beef	(B) restaurant
	Wisconsin	26	11-26				Unknown	(B) restaurant
	Guam	10	12-18				Unknown	(C) home
	Guam	18	12-27				Unknown	(D) job site
	New York City	4	1-1				Unknown	(C) home
	New York City	4	1-2				Shrimp	(B) restaurant
	New York City	2	1-4				Unknown	(B) restaurant
	New York City	4	1-6				Chinese food	(B) restaurant
	New York City	2	1-10				Unknown	(B) restaurant
	New York City	2	1-12				Unknown	(B) restaurant
	New York City	2	1-12				Unknown	(B) restaurant
	New York City	2	1-16				Corned beef	(B) restaurant
	New York City	4	1-18				Bran muffin	(B) restaurant
	New York City	2	1-18				Pizza	(B) restaurant
	New York City	4	1-18				Unknown	(B) reataurant
	New York City	2	1-24				Unknown	(B) restaurant
	New York City	2	1-26				Hamburger	(B) restaurant

New York City	2	1-26	Chicken salad	(B) restaurant
New York City	2	1-26	Unknown	(B) restaurant
New York City	2	1-?	Unknown	(B) restaurant
New York City	4	1-?	Chinese food	(B) restaurant
New York City	2	1-?	Chinese food	(B) restaurant
New York City	2	1-?	Unknown	(B) restaurant
New York City	2	1-?	Ravioli	(C) home
New York City	3	2-2	Unknown	(B) restaurant
New York City	2	2-14	Apple	(D) home
New York City	3	2-24	Unknown	(B) restaurant
New York City	2	2-25	Western omelet	(B) restaurant
New York City	3	2-26	Ham & roast beef sandwich	(B) restaurant
New York City	5	3-1	Chinese food	(B) restaurant
New York City	3	3-1	Gefilte fish	(C) home
New York City	2	3-6	Unknown	(B) restaurant
New York City	2	3-22	Unknown	(B) restaurant
New York City	2	3-22	Pizza	(C) home
New York City	2	3-24	Tuna salad	(B) restaurant
New York City	2	3-27	Unknown	(B) restaurant
New York City	2	4-1	Unknown	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data			Vehicle	Location Where Food Mishandled* And Eaten
				Patient	Vehicle	Food-handler		
(UNKNOWN)	New York City	3	4-1				Unknown	(D) home
	New York City	3	4-2				Unknown	(B) restaurant
	New York City	2	4-5				Chinese food	(B) restaurant
	New York City	2	4-6				Hamburger	(B) restaurant
	New York City	3	4-7				Pepper steak	(B) work place
	New York City	2	4-9				Chinese food	(B) restaurant
	New York City	2	4-15				Pot roast with tomato sauce	(C) home
	New York City	2	4-18				Duck	(B) restaurant
	New York City	2	4-18				Chopped liver	(B) restaurant
	New York City	4	4-20				Unknown	(B) restaurant
	New York City	3	4-20				Unknown	(B) restaurant
	New York City	2	4-21				Unknown	(B) restaurant
	New York City	3	4-23				Unknown	(B) restaurant
	New York City	3	4-30				Chinese food	(B) home
	New York City	2	5-1				Unknown	(B) home
	New York City	4	5-1				Unknown	(D) home
	New York City	2	5-5				Unknown	(B) restaurant
	New York City	3	5-7				Unknown	(B) restaurant

New York City	2	5-8	Unknown	(C) home
New York City	10	5-9	Roast beef	(C) home
New York City	2	5-16	Cake	(B) restaurant
New York City	7	5-21	Beef fried rice	(B) restaurant
New York City	4	5-25	Chicken	(B) restaurant
New York City	2	5-31	Unknown	(B) restaurant
New York City	2	5-?	Unknown	(B) restaurant
New York City	2	5-?	Unknown	(B) restaurant
New York City	2	6-2	Unknown	(B) restaurant
New York City	2	6-2	Unknown	(B) home
New York City	11	6-5	Unknown	(D) home
New York City	2	6-6	Unknown	(B) restaurant
New York City	2	6-7	Chinese food	(B) restaurant
New York City	35	6-20	Ham	(D) church
New York City	3	6-21	Ice cream	(D) street
New York City	2	6-22	Unknown	(B) restaurant
New York City	2	6-?	Unknown	(B) restaurant
New York City	3	7-6	Unknown	(B) restaurant
New York City	5	7-10	Unknown	(B) restaurant

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Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* And Eaten
(UNKNOWN)	New York City	6	7-13				Egg Foo Yong	(B) home
	New York City	2	7-30				Unknown	(B) restaurant
	New York City	3	8-2				Ham	(B) restaurant
	New York City	20	8-5				Unknown	(D) church
	New York City	19	8-6				Unknown	(B) restaurant
	New York City	4	8-7				Unknown	(B) restaurant
	New York City	2	8-7				Unknown	(B) restaurant
	New York City	6	8-8				Unknown	(B) restaurant
	New York City	10	8-13				Unknown	(B) restaurant
	New York City	3	8-16				Unknown	(B) restaurant
	New York City	3	8-18				Unknown	(B) restaurant
	New York City	3	8-19				Unknown	(B) restaurant
	New York City	5	8-22				Unknown	(C) home
	New York City	2	8-29				Corned beef	(B) restaurant
	New York City	2	9-2				Unknown	(B) work place
	New York City	4	9-2				Unknown	(B) automobile
	New York City	3	9-16				Hamburger	(B) restaurant
	New York City	2	9-20				Unknown	(B) restaurant
	New York City	6	9-24				Chinese food	(B) restaurant
	New York City	2	9-?				Chinese food	(B) home

New York City	2	10-12	Hamburger	(C) home
New York City	2	10-13	Mexican food	(B) restaurant
New York City	2	10-14	Unknown	(B) restaurant
New York City	2	10-23	Souvlaki	(B) restaurant
New York City	17	10-24	Unknown	(B) unknown
New York City	3	10-31	Roast beef sandwich	(B) adult home
New York City	3	11-5	Unknown	(B) restaurant
New York City	4	11-10	Chinese food	(B) home
New York City	9	11-12	Chicken noodle soup	(B) job site
New York City	3	11-16	Unknown	(B) restaurant
New York City	2	11-16	Unknown	(B) restaurant
New York City	351	11-17	Turkey	(B) school
New York City	5	11-18	Chinese food	(B) home
New York City	35	11-20	Ice cream	(B) nursing home
New York City	2	11-24	Chinese food	(B) home
New York City	4	11-25	Unknown	(B) restaurant
New York City	3	11-26	Clams	(B) restaurant
New York City	14	11-26	Unknown	(C) home

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable

Etiology	State	Number of Cases	Date of Onset	Lab Data			Vehicle	Location Where Food Mishandled* And Eaten
				Patient	Vehicle	Food-handler		
(UNKNOWN)	New York City	4	11-29				Unknown	(B) restaurant
	New York City	3	12-8				Unknown	(B) work place
	New York City	6	12-21				Chocolate milk	(D) school
	New York City	2	12-27				Unknown	(B) home
	New York City	3	12-30				Unknown	(B) restaurant

*(A)--Food processing establishment; (B)--Food service establishment; (C)--Home; (D)--Unknown; (E)--Not applicable

G. Guidelines for Confirmation of Foodborne Disease Outbreak

BACTERIAL	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
1. Bacillus cereus	a) incubation period 2-16 hrs. b) gastrointestinal syndrome	a) isolation of $\geq 10^5$ organisms per gram in epidemiologically incriminated food OR b) isolation of organism from stools of ill person
2. Brucella	a) incubation period several days to several months b) clinical syndrome compatible with brucellosis	a) Four fold increase in titer OR b) positive blood culture
3. Clostridium botulinum	a) incubation 2 hours - 8 days usually 12-48 hours b) clinical syndrome compatible with botulism (see CDC Botulism Manual)	a) detection of botulinal toxin in human sera, feces, or food OR b) isolation of C. botulinum organism from epidemiologically incriminated food or stools OR c) food epidemiologically incriminated
4. Clostridium perfringens	a) incubation period 9-15 hrs. b) lower intestinal syndrome--majority of cases with diarrhea but little vomiting or fever	a) organisms of same serotype in epidemiologically incriminated food and stool of ill individuals OR b) isolation of orgamisms with same serotype in stool of most ill individuals and not in stool of controls OR c) $\geq 10^5$ organisms per gram in epidemiologically incriminated food provided specimen properly handled
5. Escherichia coli	a) incubation period 6-36 hrs. b) gastrointestinal syndrome--majority of cases with diarrhea	a) demonstration of organisms of same serotype in epidemiologically incriminated food and stool of ill individuals and not in stool of controls OR b) isolation from stool of most ill individuals, organisms of the same serotype

	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
		which have been shown to be enterotoxigenic or invasive by special laboratory techniques
6. *Salmonella*	a) incubation period 6-48 hrs. b) gastrointestinal syndrome--majority of cases with diarrhea	a) isolation of *Salmonella* organism from epidemiologically implicated food OR b) isolation of *Salmonella* organism from stools of ill individuals
7. *Shigella*	a) incubation period 12-50 hrs. b) gastrointestinal syndrome--majority of cases with diarrhea	a) isolation of *Shigella* organism from epidemiologically implicated food OR b) isolation of *Shigella* organism from stools of ill individuals
8. *Staphylococcus aureus*	a) incubation period 30 min. - 8 hrs. (usually 2-4 hrs.) b) gastrointestinal syndrome--majority of cases with vomiting	a) detection of enterotoxin in epidemiologically implicated food OR b) organisms with same phage type in stools or vomitus of ill individuals and, when possible, implicated food and/or skin or nose of food handler OR c) isolation of $\geq 10^5$ organisms per gram in epidemiologically implicated food
9. *Streptococcus* Group A	a) incubation period 1-4 days b) febrile URI syndrome	a) isolation of organisms with same M and T type from implicated food OR b) isolation of organisms with same M and T type from throats of ill individuals
10. *Vibrio cholerae*	a) incubation period 1-3 days b) gastrointestinal syndrome--majority of cases with diarrhea and without fever	a) isolation of *V. cholerae* from epidemiologically incriminated food OR b) isolation of organisms from stools or vomitus of ill individuals

	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
		OR c) significant rise in vibriocidal, bacterial agglutinating, or antitoxin antibodies in acute and early convalescent sera, or significant fall in vibriocidal antibodies in early and late convalescent sera in persons not recently immunized
11. *Vibrio parahaemolyticus*	a) incubation period 15-24 hrs. b) gastrointestinal syndrome--majority of cases with diarrhea	a) isolation of $\geq 10^5$ organisms from epidemiologically implicated food (usually seafood) OR b) isolation of Kanagawa-positive organisms of same serotype from stool of ill individuals
12. Others	clinical data appraised in individual circumstances	laboratory data appraised in individual circumstances
CHEMICAL		
1. Heavy metals Antimony Cadmium Copper Iron Tin Zinc, etc	a) incubation period 5 min. to 8 hrs. (usually less than 1 hr.) b) clinical syndrome compatible with heavy metal poisoning--usually gastrointestinal syndrome and often metallic taste	demonstration of high concentraction of metallic ion in epidemiolologically incriminated food or beverage
2. Ichthyosarcotoxin		
Ciguatoxin	a) incubation period 1-36 hrs. (usually 2-8 hrs.) b) clinical syndrome compatible with ciguatera--usually initial gastrointestinal symptoms followed by dry mouth, paresthesia of lips, tongue, throat or extremities. A sensation of looseness and pain in the teeth and a pardoxical temperature sensation are characteristic	a) demonstration of ciguatoxin in epidemiologically incriminated fish OR b) ciguatera-associated fish epidemiologically incriminated

	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
Puffer fish (tetrodotoxin)	a) incubation period 10 min. to 3 hrs. (usually 10-45 min.) b) clinical syndrome compatible with puffer fish poisoning--paresthesia of lips, tongue, face or extremities often followed by numbness, loss of proprioception or a "floating" sensation	a) demonstration of tetrodotoxin in fish OR b) puffer fish epidemiologically incriminated
Scombrotoxin	a) incubation period 1 min. to 3 hrs. (usually less than 1 hr.) b) clinical syndrome compatible with scombroid fish poisoning often including flushing, headache, dizziness, burning of mouth and throat, upper and lower gastrointestinal symptoms, urticaria and generalized pruritus	a) demonstration of elevated histamine levels in epidemiologically incriminated fish OR b) fish of order Scombrodei or fish associated with scombroid poisoning (e.g., mahi-mahi) epidemiologically incriminated
3. Monosodium glutamate	a) incubation period 3 min. to 2 hrs. (usually less than 1 hr.) b) clinical syndrome compatible with monosodium glutamate intoxication--often including burning sensations in chest, neck, abdomen or extremities, sensations of lightness and pressure over face, or a heavy feeling in the chest	history of large amounts (usually $\geq$1.5 grams) of MSG having been added to epidemiologically incriminated food
4. Mushroom poison		
Group containing ibotenic acid and muscimol	a) incubation period 1-12 hrs. (usually less than 4 hrs.) b) clinical syndrome compatible with mushroom poisoning by this group--often including confusion, delirium, visual disturbances	a) demonstration of toxic chemical in epidemiologically incriminated mushrooms OR b) epidemiologically incriminated mushrooms identified as a toxic type
Group containing amatoxins and phallotoxins, or gyromitrin	a) incubation period 5-18 hrs. b) characteristic clinical syndrome compatible with mushroom poisoning by this group--upper and lower gastrointestinal symptoms followed by hepatic and/or renal failure	a) demonstration of toxic chemical in epidemiologically incriminated mushrooms OR b) epidemiologically incriminated mushrooms identified as a toxic type

	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
Groups containing muscarine, psilocybin and psilocin, gastro-intestinal irritants, disulfiram-like compounds	a) characteristic incubation period b) clinical syndrome compatible with mushroom poisoning by these groups	a) demonstration of toxic chemical in epidemiologically incriminated mushrooms OR b) epidemiologically incriminated mushroom identified as toxic type
5. Paralytic and neurotoxic shellfish poison	a) incubation period 30 min. to 3 hrs. b) clinical syndrome compatible with paralytic shellfish poisoning--often including paresthesia of lips, mouth or face and often upper and lower gastrointestinal symptoms	a) detection of toxin in epidemiologically incriminated mollusks OR b) detection of large numbers of shellfish poisoning-associated species of dinoflagellates in water from which epidemiologically incriminated mollusks gathered
6. Other chemicals	clinical data appraised in individual circumstances	laboratory data appraised in individual circumstances
PARASITIC AND VIRAL		
1. *Trichinella spiralis*	a) incubation period 3-30 days b) clinical syndrome compatible with trichinosis--often including fever, high eosinophil count, orbital edema, myalgia	a) muscle biopsy from ill individual OR b) serological tests OR c) demonstration of larvae in incriminated food
2. Hepatitis A	a) incubation period 10-45 days b) clinical syndrome compatible with hepatitis--usually including jaundice, GI symptoms, dark urine	liver function tests compatible with hepatitis in affected persons who consumed the epidemiologically incriminated food
3. Others	clinical evidence appraised in individual circumstances	laboratory evidence appraised in individual circumstances

H. Selected Foodborne Outbreak Articles, 1976, Taken from Morbidity and Mortality Weekly Report

Staphylococcal Food Poisoning--Colorado
(MMWR 26(4):22, 1977)

The Tri-County District Health Department (Denver) notified the Colorado Department of Health July 28, 1976, of a staphylococcal food poisoning outbreak among employees of a Denver business related to a food vending machine. Eleven workers had become violently ill in the mid- and late afternoon with nausea and vomiting. A few had diarrhea, but none had chills or fever. One patient was hospitalized. There was a statistically significant association between purchase of Greek spaghetti and illness ($p<.001$). Persons who ate other foods from the vending machines as well as some additional purchasers of Greek spaghetti did not become sick.

Because the catering firm supplying the hot food vending machines also served 15 other businesses at 29 locations in the greater Denver area, further inquiries were made to identify other affected persons. Three sick employees from 2 other businesses were found. They had typical symptoms of staphylococcal food poisoning. All 3 had also eaten Greek spaghetti from hot food vending machines on July 28. One of the 3 also was hospitalized.

Because the vending machine company routinely prepared hot food items the day before sale, a questionnaire was given to food preparation employees about illness and food consumption at work on July 27. Two out of 10 evening employees reported illnesses characterized by abrupt onset of nausea and vomiting at 10:30 PM and lasting a few hours. They had eaten Greek spaghetti that evening at 6:00 PM. Six of 8 other evening employees also ate Greek spaghetti but did not become ill with typical symptomatology. On the regular day shift, only 3 of 15 individuals had eaten Greek spaghetti; none of them had become ill.

Coagulase-positive *Staphylococcus aureus*, phage type 85, was cultured from the stool of the 2 hospitalized patients, the hands of 1 of the 5 foodhandlers preparing Greek spaghetti, the Greek spaghetti from 2 vending machines, and from the same brand of raw meat used in the Greek spaghetti.

S. aureus counts on Greek spaghetti recovered on July 28 at a temperature of 60 F from a vending machine at a Denver business were greater than a million organisms per gram. Greek spaghetti taken the same day from other vending machines at 160 F was culture-negative. Other hot food items prepared on the same day taken from several machines on July 28 were also found to be contaminated with *S. aureus*, phage type 85, in smaller numbers. This same organism was also isolated from chili made the following day. Enterotoxin studies by the Food and Drug Administration laboratories found type D enterotoxin in samples of the implicated spaghetti taken the day of the outbreak from the machine at 160 F and in samples taken from another unheated machine with a temperature of 60 F. However, all samples of *Staphylococcus* type 85 were found to produce enterotoxin type A. Type D enterotoxin was also recovered from the chili samples taken the day of outbreak at the food preparation area of the vending machine company.

The infected foodhandler had several blisters and a bandage on his hand when the cultures were taken. He handled the raw meat before cooking and, later in the day, helped portion cooked meat onto the spaghetti. In this food operation, bare hands were routinely used for preparing cooked meat. An evaluation by Tri-County District Health Department sanitarians revealed that the central commissary refrigerator was inadequate to cool foods quickly. Many hot food items were found to be at a temperature favorable for growth of *S. aureus* as long as 8 hours.

Note: This investigation shows that documentation of a small number of cases may well reveal an extensive problem from a commercial product requiring public health control measures. The widespread finding of *S. aureus*, phage type 85, in this outbreak indicates that there was extensive cross-contamination because of poor foodhandling practices. The presence of type D enterotoxin suggests that the original toxin-producing organism was no longer recoverable at the time of the outbreak because other staphylococcal strains had overgrown the unidentified toxin-producing strain.

Salmonella bovis-morbificans in Precooked Roasts of Beef
(MMWR 25(42):333, 1976)

An outbreak of salmonellosis in New Jersey, Pennsylvania, and Connecticut during August 1976 has been epidemiologically traced to precooked, packaged, ready-to-eat beef served in several delicatessens and sandwich shops.

Clinical findings in affected cases consisted of diarrhea, cramps, chills, and fever. Six of the 21 patients were hospitalized. Most cases occurred August 7-19, and most had eaten at delicatessens and sandwich shops before their illnesses.

The outbreak was first recognized when inquiries were received from the New Jersey and Pennsylvania departments of health on successive days concerning an increase in the number of isolates of Salmonella bovis-morbificans. Review of the national surveillance data revealed a 3-fold increase in the isolations of this serotype over a corresponding period in 1975. Excluding a 19-case March outbreak at a home for the retarded in Philadelphia, the increase occurred during the months of June, July, but predominantly August, and involved the states of New Jersey, Pennsylvania, Connecticut, and Massachusetts. The number of isolates included 11 from New Jersey, 12 from Pennsylvania, 12 from Connecticut, and 8 from Massachusetts, with 6, 5, 7, and 4 of these, respectively, occurring during the month of August. A total of 21 ill persons were interviewed in New Jersey, Pennsylvania, Delaware (which also had an isolate during August), and Connecticut.

Initial questioning of cases revealed prominent consumption of roast beef. A case-control study comparing precooked roast beef consumption among cases in New Jersey, Pennsylvania, Connecticut, and Delaware, and among age-sex matched neighborhood controls demonstrated a statistically significant association with the consumption of roast beef ($p=.000008$). The New Jersey and Pennsylvania cases had eaten roast beef at several different delicatessens which served precooked, packaged roast beef from Company A. This company's brand was significantly associated with illness ($p=.00005$).

Roast beef consumed by 4 of 7 cases in Connecticut was obtained from a single grocery chain delicatessen; it had received its precooked, packaged roast beef from its commissary in Boston, Massachusetts (Company B). One of the remaining 3 Connecticut cases had consumed turkey which had been purchased from Company B.

In early October, after this information was obtained, the U.S. Department of Agriculture inspected and obtained cultures from the environment and meat products at the processing plants and reviewed the cooking procedures at these companies. Inspection of Plant A revealed that the beef there was cooked to an internal temperature of 135 F. Review of the beef processing in Company B's plant revealed that beef was cooked to an internal temperature of 115 F, then removed and the temperature allowed to rise to an internal temperature of 125 F.

No Salmonella organisms were obtained from the meat products. Sources of raw meat in both plants were imported beef.

Editorial Note: Salmonella bovis-morbificans is a rare serotype; an annual average of less than 25 isolates from humans has been reported in the years 1968-1975 with the exception of 1974 when there were 60 isolates. The majority of the 1974 isolates were from a Philadelphia outbreak in which epidemiologic investigation failed to incriminate a common vehicle.

The organism S. bovis-morbificans has been isolated on occasion from imported beef (1). It has been associated with outbreaks due to beef products reported in Australia and England (2).

A common source of both Company A's and Company B's products contamination is suggested by the single rare serotype that caused this outbreak. In a previously reported outbreak (3) 2 different companies' products were similarly contaminated with a different rare serotype, S. saint-paul. The occurrence of these 2 large outbreaks caused by the precooked roasts of beef of 4 companies within the period of about 1 year implies that additional control measures that focus on control of cross-contamination and higher cooking temperatures may be needed to insure the safety of this product.

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2. Jellard CH, Jolly H, and Brown RN. An outbreak of S. bovis-morbificans infection in a children's ward. Lancet 21, Feb 1959, p 390
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Salmonellosis Associated with Homemade Ice Cream--Michigan (MMWR 26(12):94, 1977)

An outbreak of intestinal illness in which homemade ice cream was the presumed vehicle of infection occurred July 5, 1976, in 3 neighboring counties in Michigan.

The outbreak involved 7 individuals, ranging in ages from 2 to 63 years, who became ill with symptoms of nausea, vomiting, diarrhea, abdominal cramps, chills, fever, and myalgia. The onset of symptoms began 12 to 24 hours after consumption of the suspect food. Four persons were hospitalized, and 2 others sought medical treatment. The mean duration of hospitalization was 5 days; no deaths occurred. Stool cultures from 3 ill individuals were positive for Salmonella typhimurium.

The 7 ill individuals were members of a family who assembled on July 3 for an Independence Day celebration. The food item common to all ill individuals was homemade ice cream; 2 persons at the gathering ate only this item. Two other family members who did not eat the ice cream remained well.

The ice cream had been prepared by mixing raw fresh eggs obtained from the family farm, evaporated milk, pasteurized milk, sugar, and vanilla flavoring. The mixture (custard) was not cooked, but was frozen immediately after it was mixed. When samples of the ice cream and the ingredients used to prepare it were cultured, S. typhimurium was isolated both from the ice cream and from a pool of 2 remaining unbroken eggs, but not from other ingredients.

Eggs used in this preparation had been collected from feces-encrusted metal nests. The eggs may have been in the nests for as long as 7 to 10 hours before being collected. The eggs had been washed just after collection and then stored under refrigeration for approximately 24 hours before being mixed with the ice cream custard. All eggs in the batch were reported to have had intact shells; however, 2 eggs from the same batch that were submitted for culture were cracked when received at the laboratory. One week after the outbreak, 12 eggs from the same farm were cultured for Salmonella organisms. Cultures of the outer shell and internal contents failed to grow the organism.

Editorial Note: Salmonella organisms that are pathogenic to man may be present in the intestinal tract of domestic egg-laying hens. Such organisms may contaminate eggs by penetration through the egg shell and, more rarely, by direct ovarian transmission (1,2). Cracks (checks) in the egg shell may permit Salmonella organisms to enter the egg rapidly; however, less frequently penetration through pores in the intact shell may occur (1,2).

As in this outbreak, ungraded eggs rather than commercially graded eggs are the usual cause of such outbreaks. Eleven outbreaks of Salmonella enteritis due to homemade ice cream have been reported to CDC from 1973 to 1975; the source was farm or home-produced chicken eggs in 6 (55%), duck eggs (presumably farm or home-produced) in 2 (18%), and unknown in 3 (27%).

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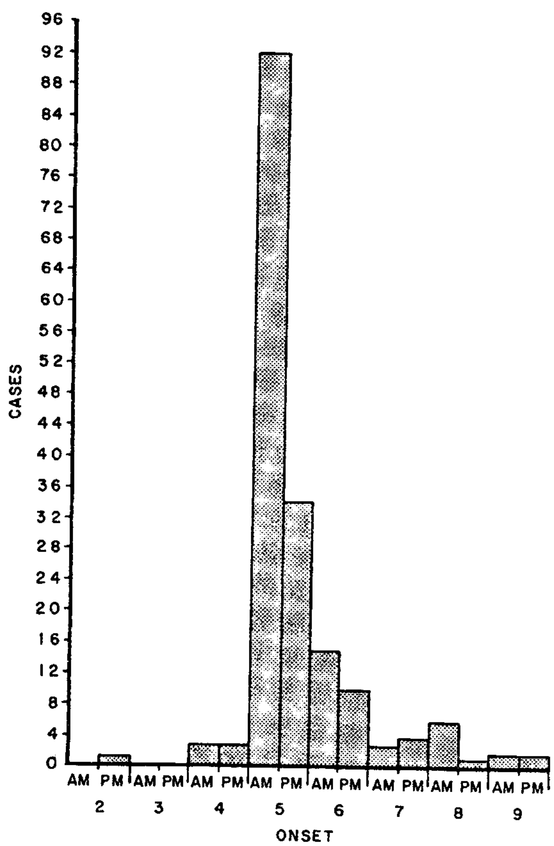
2. Adler HE: Salmonella in eggs - an appraisal. Food Technology 19:191-192, 1965

Outbreak of Shigellosis--Fort Bliss, Texas
(MMWR 26(13):107, 1977)

An outbreak of foodborne shigellosis occurred on November 5, 1976, in a tactical unit conducting field training exercises at Fort Bliss, Texas. Of 850 soldiers at risk, 176 became ill with diarrheal disease; 53 were hospitalized.

The onset of the majority of the cases (92) was between 1 a.m. and noon on November 5; an additional 34 cases occurred during the second half of the day. Excluding the suspected index case, the range of onset was from November 4 to 9 (Figure 3).

Fig. 3 GASTROINTESTINAL DISEASE BY TIME OF ONSET, FORT BLISS, TEXAS, NOVEMBER 1976



The disease was characterized by rapid onset with fever up to 105 F, abdominal cramps, profuse diarrhea (bloody in several cases), and frequent vomiting. Many of the more serious cases with high fevers complained of severe myalgia with backache. The mean duration of the disease was 4 days, with a range from 1 to 8 days. The longest period of hospitalization was 5 days; however, most of the hospitalized cases were discharged within 48 hours. All of the cases recovered without sequelae. Stool cultures were positive for Shigella boydii, serotype 2, in 29 individuals.

The distribution of times of onset and the nature of the illness typified a foodborne infection originating from a common source. Although the unit was operating under field conditions, there was a common mess hall where the majority of the personnel ate their meals. A limited number of meals were prepared separately and delivered to troops at various outlying areas; most of these meals were distributed at noon.

Interviews with a large sampling of soldiers concerning food ingestion on November 3 and 4 revealed a statistically significant association between eating spaghetti at the evening meal on November 3 and subsequent diarrheal disease (Table 12).

The mean incubation period calculated from the time of ingestion of the spaghetti at the evening meal of November 3 was 50.5 hours. The spaghetti was not available for culturing. However, water, milk, and several other foods that were available failed to demonstrate any contamination with enteric pathogens.

Of the 26 foodhandlers working in the mess hall at the time of the outbreak, 12 were symptomatic with diarrheal disease. Nine of the symptomatic and 1 of the asymptomatic foodhandlers had positive stool cultures for S. boydii, serotype 2. One of the foodhandlers responsible for preparing the spaghetti reported having had diarrheal disease at the time he prepared the spaghetti. This foodhandler had spent the preceding weekend (October 30-31) in Jaurez, Mexico; 2 days later he had onset of illness.

Table 12

Attack Rate by History of Consumption of Spaghetti, Fort Bliss, November 1976

	Ill	Not Ill	Total
Ate spaghetti	84	64	148
Did not eat spaghetti	1	12	13
Total	85	76	161

p=.001

The meat sauce had been prepared the morning of the outbreak, while the spaghetti was prepared in the afternoon several hours before being served. The spaghetti and sauce were reportedly reheated before serving. However, field mess facilities, including those for handwashing, were limited, and there is some question whether the reheating was performed as prescribed.

The following control measures were taken:

1. All foodhandlers associated with the outbreak were removed from the mess line and rectal swabs taken. The foodhandlers were not allowed to work at that job until they had consecutive negative cultures taken at least 24 hours apart. Cultures were not taken until at least 48 hours after discontinuance of antimicrobials. (Symptomatic foodhandlers were placed on 2 gms ampicillin daily for 7 days.)

2. Meticulous attention to food preparation procedures, especially handwashing for mess personnel, which included brushing of fingers and nails, was instituted. All food service personnel were continuously monitored for signs or symptoms of disease, and proper foodhandling techniques were emphasized.

3. All persons who were ill or had a positive culture were instructed in proper sanitary practices by a community health nurse. Special attention was given to soldiers with families to insure that secondary cases did not occur in family units. All family contacts were instructed to report any occurrence of diarrheal disease.

Editorial Note: This outbreak was unusual in 2 respects: Shigellae are an uncommon cause of foodborne illness, and Shigella boydii is an unusual causes of Shigella dysentary in the United States. In 1975, only 2% of all Shigella isolates reported to the Shigella Surveillance System at CDC were S. boydii. Most of these infections probably were acquired during foreign travel. Although it is difficult to incriminate conclusively the individual who apparently contaminated the spaghetti sauce, it is possible that he acquired S. boydii infection during his trip to Mexico.

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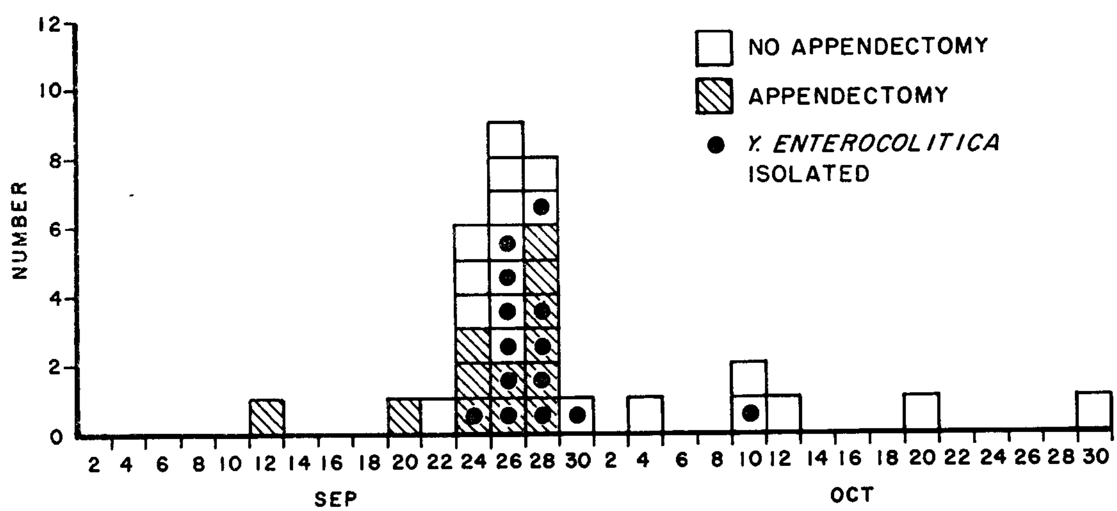
Yersinia enterocolitica Outbreak--New York
(MMWR 26(7):53, 1977)

An outbreak of intestinal illness occurred in September 1976, among school children in Oneida County, New York. Yersinia enterocolitica, serotype 8, was isolated from ill children and from chocolate milk that had been epidemiologically incriminated as the vehicle of transmission.

The illness, characterized by abdominal pain, fever, and in some, diarrhea, affected 218 children attending 5 Oneida County schools. Thirty-three school children were hospitalized for suspected appendicitis; 13 had appendectomies (Figure 4). In each case at surgery the appendix was normal or only slightly inflamed. Mesenteric adenopathy and inflammation of the terminal ileum were frequently observed. The removed appendices were microscopically normal or had lymphoid hyperplasia.

Fig. 4 CHILDREN FROM 5 SCHOOLS HOSPITALIZED WITH ABDOMINAL PAIN AND FEVER, BY DATE OF ONSET, SEPTEMBER-OCTOBER, 1976



Three of the 5 schools and the central food service for all 5 schools were located in 1 village (Village A). At first, the water was suspected as the source of contamination, since in August, 1 month before the outbreak, Village A residents had been instructed to boil drinking water because of deficiencies in the treatment of village water. However, a door-to-door survey, conducted in Village A and in a nearby control village with a different water supply, demonstrated that illness - defined as abdominal pain and fever since September 1 - was not associated with consumption of Village A water. The survey did demonstrate that the illness occurred predominantly in school-age children in Village A and that their illness was associated with eating lunch at school.

A case-control study was performed in which a case was defined as a child from 1 of the 5 schools who had been hospitalized for suspected appendicitis during September and October. Controls were matched by age, sex, and school classroom with the cases. Of 10 possible exposures, including consumption of school water, food, and white and chocolate milk, only drinking chocolate milk at school was significantly associated with illness. Twenty-six (81%) of 32 ill children drank chocolate milk compared with 19 (59%) of 32 control children ($p<.05$, McNemar Test). A survey of high school students also demonstrated the association of illness with consumption of chocolate milk.

Thirty-two ill school children were found to be infected with Y. enterocolitica; 27 of the isolates have been serotyped and all are serotype 8. One well child was infected with Y. enterocolitica, serotype 5. Y. enterocolitica, serotype 8, was isolated from 1 of 4 unopened 8-ounce cartons of chocolate milk taken from 1 of the school cafeterias during the investigation.

A local dairy was the exclusive producer of chocolate milk for the area schools. The dairy also supplied chocolate milk to 1 small grocery. In the dairy plant, chocolate syrup was manually added to a large open vat of pasteurized milk. This chocolate milk was not re-pasteurized before being placed in cardboard, half-pint cartons. Milk was distributed to the schools in an unrefrigerated truck. Several cultures of canned chocolate syrup were negative. No dairy employees were culture-positive. The dairy voluntarily ceased production of chocolate milk when informed in late October of the evidence associating its chocolate milk with illness.

Editorial Note: This is the first outbreak of illness from Yersinia enterocolitica in which foodborne transmission has been documented. In 2 previous outbreaks among school children the source and mode of spread of the infection were not established (1). Milk was suspected as the vehicle in a recent outbreak of Y. enterocolitica in Canada (2).

The predominant symptoms in this outbreak - abdominal pain and fever - can only closely simulate appendicitis, but actually represent mesenteric adenitis and in some cases terminal ileitis. In the Scandanavian countries, where yersiniosis has been more extensively studied, infection with Y. enterocolitica can be demonstrated by stool/appendix culture in 3-5% of patients with symptoms of appendicitis (3,4). Other clinical syndromes, including abscesses, acute diarrhea, erythema nodosum, and arthritis have also been reported in association with Yersinia infection.

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III. WATERBORNE DISEASE OUTBREAKS, 1976

In 1976, 35 waterborne disease outbreaks were reported to the Center for Disease Control for the United States, an increase of 46% over 1975.

A. Definition of Outbreak

A waterborne disease outbreak is defined in this report as an incident in which 1) 2 or more persons experience similar illness after consumption of water, and 2) epidemiologic evidence implicates the water as the source of illness.

There is 1 exception; 1 case of chemical poisoning constitutes an outbreak if the water is demonstrated to be contaminated by the chemical. In most of the reported outbreaks, the implicated water source was demonstrated to be contaminated; only outbreaks associated with water used for drinking are included.

B. Sources of Data

Waterborne disease outbreaks are reported to CDC by state health departments. A standard reporting form that was pretested in 8 states is now being used (see Section E). In addition, the Health Effects Research Laboratory, Environmental Protection Agency (EPA), contacts all state water supply agencies to obtain information about waterborne disease outbreaks and these data are included in this report. Personnel from CDC and EPA work together in the investigation and evaluation of waterborne disease outbreaks. When requested by a state health department, CDC and EPA can offer epidemiologic assistance, provide expertise in the engineering and environmental aspects of water purification, and as indicated, provide large volume water sampling for isolation of viruses, parasites (Giardia), and specific bacterial pathogens. Data obtained on outbreaks are reviewed and summarized by representatives from CDC and EPA. A line listing of reported waterborne disease outbreaks in 1976 is included (see Section F).

In this report, municipal systems are defined as public or investor-owned water supplies that serve large or small communities, subdivisions and trailer parks of at least 15 service connections or 25 year-round residents. Semipublic water systems are present systems in institutions, industries, camps, parks, hotels, service stations, etc., which have their own water system available for use by the general public. Individual water systems, generally wells and springs, are those used by single or several residences or by persons traveling outside of populated areas (e.g. back-packers).

C. Interpretation of Data

Data included in this summary of waterborne disease outbreaks have limitations similar to those outlined in the foodborne disease summary and must be interpreted with caution since they represent only a small part of a larger public health problem. These data are helpful in revealing the various etiologies of waterborne diseases, the seasonal occurrence of outbreaks, and the deficiencies in water systems that most frequently result in outbreaks. As in the past the pathogen(s) responsible for many outbreaks in 1976 remains unknown. It is hoped that advances in laboratory techniques and standardization of reporting of waterborne disease outbreaks will augment our knowledge of waterborne pathogens and the factors responsible for waterborne disease outbreaks.

D. Analysis of Data

In 1976, 35 waterborne disease outbreaks, an increase of 46% from 1975 (24 outbreaks) and 5,068 cases, a decrease of 53% from 1975 (10,879 cases), were reported to CDC (Table 1). Increased reporting by certain states probably accounts for the increased number of outbreaks in 1976. Of 35 outbreaks, Pennsylvania reported 14 (40%), affecting 424 individuals (median of 21 per outbreak); 12 involved semipublic water and 2 individual water systems.

Figure 1 shows the geographic distributions of outbreaks by state. Sixteen states and Puerto Rico reported at least 1 outbreak. Figure 2 depicts the trend in reported waterborne disease outbreaks in the period 1938-1976.

Table 2 shows the number of outbreaks and cases by etiology and type of water system. Of 35 outbreaks 26 (74%) were designated as "acute gastrointestinal illness." This category includes outbreaks characterized by upper and/or lower gastrointestinal symptomatology for which no specific etiologic agent was identified. In previous years these outbreaks were grouped under the category "sewage poisoning." There were 9 (26%) outbreaks of known etiology: chemical (3), Giardia lamblia (3), Shigella (2), and Salmonella (1). In the 3 largest outbreaks an etiologic agent was found; Shigella sonnei in Puerto Rico (2,150 cases), Salmonella typhimurium in New York (750 cases) and Giardia lamblia in Washington (600 cases).

The 3 chemical outbreaks reported were due to lead (2.2 mg per liter in water samples), chlordane (a pesticide - 1,200 mg per liter in water samples) and polychlorinated biphenyls (pcb's - 900 mg per liter in water samples). In the 33 nonchemical outbreaks, microbiologic water sample results were reported in 28. Evidence of fecal contamination (total or fecal coliforms) or pathogens were found in water samples collected during 27 of the outbreaks. Salmonella typhimurium was isolated from water in the New York outbreak and Giardia cysts were isolated from water in outbreaks in Colorado, Vermont, and Washington. In outbreaks where pathogens were isolated from the water supply, coliforms were reported in only 1, an outbreak of giardiasis involving the use of untreated surface water where 23 coliforms per 100 ml (MPN) were found. The other outbreaks of giardiasis involved surface water sources that were disinfected, and it is possible that chlorination was sufficient to destroy indicator organisms such as coliforms but not Giardia cysts. The outbreak of salmonellosis was caused by a cross-connection, and it is not known if timely water sampling for coliforms was conducted in conjunction with the sampling for pathogens. It is important that an attempt be made to isolate pathogens from the water supply during an outbreak to help establish the etiology, but it is equally important to also document the presence of coliforms and document their relative importance as indicator organisms for use in routine surveillance of water supplies.

Most outbreaks involved semipublic (66%) and municipal (26%) water systems, and fewer involved individual (8%) systems (Table 3). This distribution is almost identical to 1975. Outbreaks attributed to water from municipal systems affected an average of 418 persons compared with 55 persons in outbreaks involving semipublic systems and 15 persons in outbreaks associated with individual water systems. Deficiencies in treatment (inadequately or untreated water) accounted for 29 (83%) of the outbreaks. Untreated water (surface or ground) accounted for 18 of the 29 outbreaks.

Of the 23 outbreaks associated with semipublic water supply systems, 17 (74%) involved visitors to areas used mostly for recreational purposes. Of these 17, 13 occurred in the summer months May through September (Table 4).

Comments

The 46% increase in the number of outbreaks reported in 1976 is probably due to more complete reporting. Diligent investigation, such as was done in outbreaks reported from Pennsylvania, can uncover relatively small waterborne outbreaks that often originate from semipublic water systems. It is hoped that similar investigation and reporting will be done by other states so that major deficiencies commonly affecting semipublic water systems, especially in recreational areas, can be better understood and ultimately corrected.

As in recent years outbreaks originating from semipublic water systems in recreational areas contributed significantly to the total number of waterborne outbreaks reported in 1976. Water systems used on a seasonal basis or those that do not usually have an overwhelming demand placed on them by large numbers of visitors are showing the strains of such pressure. Water supply systems in such areas, especially national, state, and local parks, must be routinely reappraised and monitored and corrections made to insure safe water under increased demands. The large outbreak (more than 1,000 cases) that occurred in 1975 in Crater Lake National Park underscores the actual and potential problems that can occur in recreational areas.

Coliform organism identification is used as an indication of fecal contamination of water supplies and is widely employed in routine surveillance programs. Negative results have usually been interpretated as providing assurance that the water is free of enteric pathogens. This interpretation must be reevaluated in light of data available from waterborne outbreaks of giardiasis. In the 2 outbreaks of giardiasis where disinfection was provided, Giardia cysts were found in the water supply in the absence of coliforms. Although adequate disinfection data are not currently available, it is felt that Giardia cysts are as resistent to chlorination as cysts of Entamoeba histolytica, and high concentrations of chlorine and long contact times would, therefore, be required for cyst inactivation. Almost all of the outbreaks of giardiasis documented in the U.S. since 1965 have occurred as the result of drinking untreated surface water or surface water whose only treatment was disinfection. Disinfection practices normally employed in these systems would not provide for high concentrations of chlorine or long contact times, and it's likely that Giardia cysts could survive the treatment whereas coliforms would not. The coliform test in these situations would not provide assurance that an outbreak of giardiasis would be prevented.

The giardiasis outbreak in Washington is the first documented waterborne outbreak of giardiasis involving a filtered water supply. Treatment for the surface water source consisted of a mixed-media pressure filter and disinfection; no sedimentation was employed prior to filtration. In the outbreak, failure of the chlorination equipment occurred, and a number of deficiencies were noted in the installation and operation of the pressure filters, including ineffective pretreatment or conditioning of filters with appropriate chemicals. Water filtration theory indicates that organisms the size of Giardia cysts should be removed by conventional sand filters; however, effective pretreatment of the water prior to filtration must be accomplished. Conventional treatment of surface water generally includes coagulation/flocculation and settling prior to filtration or if the settling process is not used the addition of appropriate chemicals for conditioning of the filter media. Pressure filters are generally utilized for iron and manganese removal and for a number of reasons are generally not considered effective for microbiological treatment. The data to date would indicate that well operated conventional treatment plants employing coagulation/flocculation, settling, and filtration are successful in preventing outbreaks of this disease.

Fig. 1 WATERBORNE DISEASE OUTBREAKS, 1976

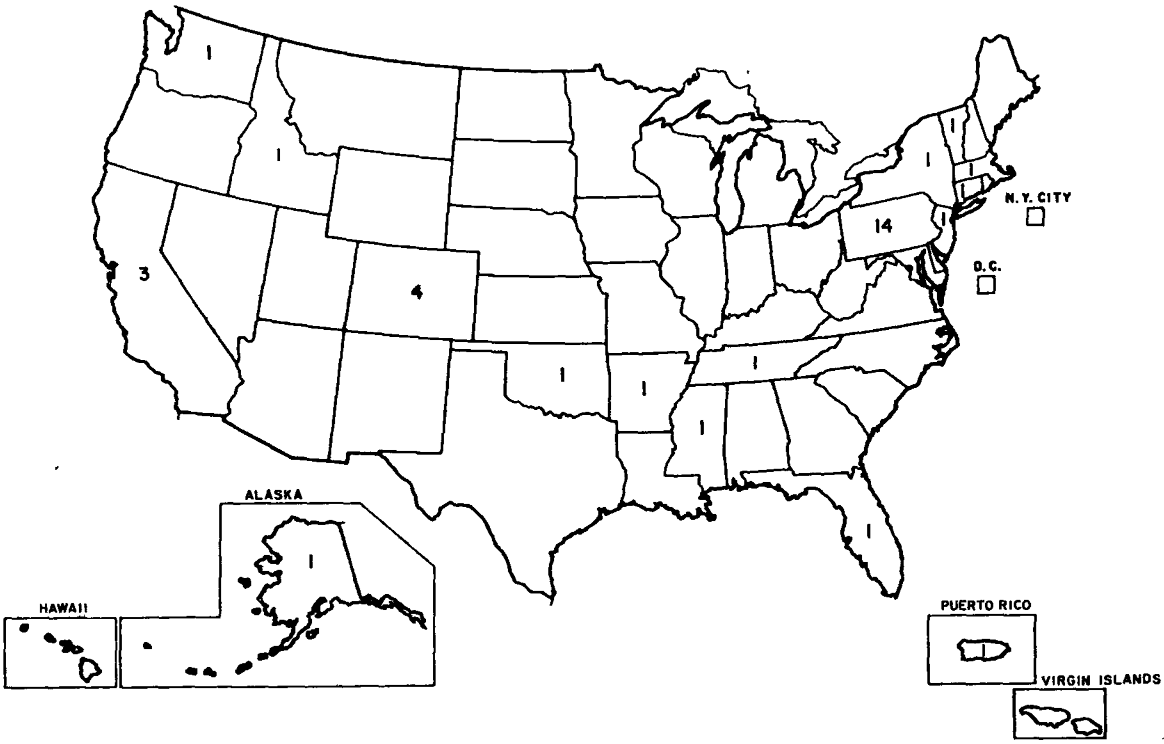
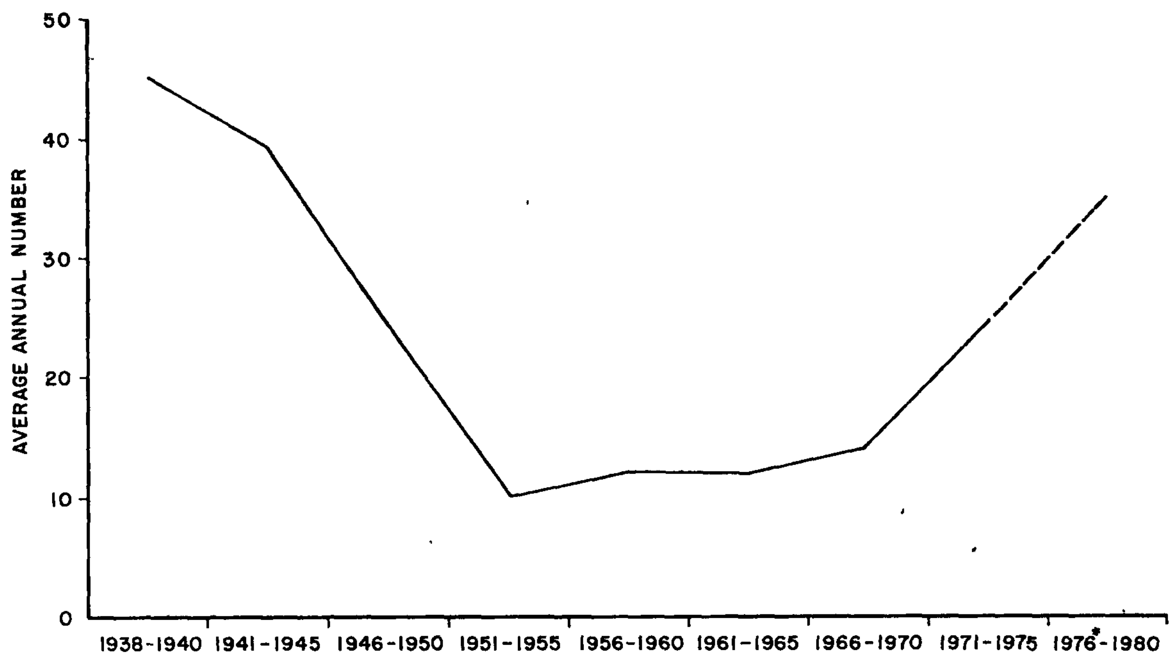


Fig. 2 AVERAGE ANNUAL NUMBER WATERBORNE DISEASE OUTBREAKS, 1938 - 1976



*NUMBER CASES FOR 1976 ONLY

Table 1

Waterborne Disease Outbreaks, 1972--1976

	1972	1973*	1974*	1975	1976	Total
Outbreaks	29	26	25	24	35	139
Cases	1,638	1,774	8,356	10,879	5,068	27,715

*Revised totals

Table 2

Waterborne Disease Outbreaks, by Etiology and Type of Water System, 1976

	MUNICIPAL		SEMIPUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Acute gastro-intestinal illness	4	229	21	1,216	1	24	26	1,469
Chemical poisoning	1	13	0	0	2	22	3	35
Giardiasis	1	600	2	39	0	0	3	639
Shigellosis	2	2,175	0	0	0	0	2	2,175
Salmonellosis	1	750	0	0	0	0	1	750
Enterotoxigenic *E. coli*	0	0	0	0	0	0	0	0
Hepatitis	0	0	0	0	0	0	0	0
TOTAL	9	3,767	23	1,255	3	46	35	5,068

Table 3

Waterborne Disease Outbreaks, by Type of System, and Cause of System Deficiency, 1976

	MUNICIPAL		SEMIPUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Untreated surface water	1	25	2	39	1	24	4	88
Untreated ground water	2	77	11	790	1	20	14	887
Treatment deficiencies	3	2,900	8	362	0	0	11	3,262
Deficiencies in distribution system	2	763	1	60	1	2	4	825
Miscellaneous	1	2	1	4	0	0	2	6
TOTAL	9	3,767	23	1,255	3	46	35	5,068

Table 4

Waterborne Disease Outbreaks Involving Semipublic Water Supplies, by Month, and Population Affected, 1976

Month	Number of Outbreaks	Usual Population*	Visitors**
January	-	-	-
February	1	1	-
March	-	-	-
April	3	2	1
May	3	1	2
June	7	2	5
July	5	-	5
August	1	-	1
September	-	-	-
October	1	-	1
November	1	-	1
December	1	-	1
TOTAL	23	6	17

*Outbreaks affecting individuals using the water supply on regular basis

**Outbreaks affecting individuals not using the water supply on a regular basis

Table 5

Waterborne Disease Outbreaks, by Month of Occurrence, 1976

Month	Number of Outbreaks	Month	Number of Outbreaks
January	0	July	7
February	2	August	2
March	2	September	0
April	4	October	3
May	5	November	2
June	7	December	1

TOTAL 35

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
BUREAU OF EPIDEMIOLOGY
ATLANTA, GEORGIA 30333

E. INVESTIGATION OF A WATERBORNE OUTBREAK

FORM APPROVED
OMB NO. 68-R557

1. Where did the outbreak occur?

State ____________ (1-2) City or Town ____________ County ____________

2. Date of outbreak: (Date of onset of 1st case)

____________ (3-8)

3. Indicate actual (a) or estimated (e) numbers:

Persons exposed ________ (9-11)
Persons ill ________ (12-14)
Hospitalized ________ (15-16)
Fatal cases ________ (17)

4. History of exposed persons:

No. histories obtained ________ (18-20)
No. persons with symptoms ________ (21-23)
Nausea ______ (24-26) Diarrhea ______ (33-35)
Vomiting ______ (27-29) Fever ______ (36-38)
Cramps ______ (30-32)
Other, specify (39) ________

5. Incubation period (hours):

Shortest ______ (40-42) Longest ______ (43-45)
Median ______ (46-48)

6. Duration of illness (hours):

Shortest ______ (49-51) Longest ______ (52-54)
Median ______ (55-57)

7. Epidemiologic data (e.g., attack rates [number ill/number exposed] for persons who did or did not eat or drink specific food items or water, attack rate by quantity of water consumed, anecdotal information) * (58)

ITEMS SERVED	NUMBER OF PERSONS WHO ATE OR DRANK SPECIFIED FOOD OR WATER				NUMBER WHO DID NOT EAT OR DRINK SPECIFIED FOOD OR WATER			
	ILL	NOT ILL	TOTAL	PERCENT ILL	ILL	NOT ILL	TOTAL	PERCENT ILL

8. Vehicle responsible (item incriminated by epidemiologic evidence): (59-60) ____________

9. Water supply characteristics

(A) Type of water supply** (61)
- ☐ Municipal or community supply (Name ____________)
- ☐ Individual household supply
- ☐ Semi-public water supply
  - ☐ Institution, school, church
  - ☐ Camp, recreational area
  - ☐ Other, ____________
- ☐ Bottled water

(B) Water source *(check all applicable)*: (62-65)
- ☐ Well
- ☐ Spring
- ☐ Lake, pond
- ☐ River, stream

(C) Treatment provided *(circle treatment of each source checked in B)*:

a b c d
a b c d
a b c d
a b c d

a. no treatment
b. disinfection only
c. purification plant — coagulation, settling, filtration, disinfection *(circle those applicable)*
d. other ____________

10. Point where contamination occurred: (66)

☐ Raw water source ☐ Treatment plant ☐ Distribution system

*See HSM 4.245 (NCDC) Investigation of a Foodborne Outbreak, Item 7.
**Municipal or community water supplies are public or investor owned utilities. Individual water supplies are wells or springs used by single residences. Semipublic water systems are individual-type water supplies serving a group of residences or locations where the general public is likely to have access to drinking water. These locations include schools, camps, parks, resorts, hotels, industries, institutions, subdivisions, trailer parks, etc., that do not obtain water from a municipal water system but have developed and maintain their own water supply.

CDC 4.461
2-75

This report is authorized by law (Public Health Service Act, 42 USC 241) and is also recommended by the Conference of State and Territorial Epidemiologists. While your response is voluntary, your cooperation is necessary for the understanding and control of the diseases.

11. Water specimens examined: (67)
(Specify by "X" whether water examined was original (drunk at time of outbreak) or check-up (collected before or after outbreak occurred)

ITEM		ORIGINAL	CHECK UP	DATE	FINDINGS		BACTERIOLOGIC TECHNIQUE (e.g., fermentation tube, membrane filter)
					Quantitative	Qualitative	
Examples:	Tap water	X		6/12/74	10 fecal coliforms per 100 ml.		
	Raw water		X	6/2/74	23 total coliforms per 100 ml.		

12. Treatment records: *(Indicate method used to determine chlorine residual):*
Example: Chlorine residual — One sample from treatment plant effluent on 6/11/74 — trace of free chlorine
Three samples from distribution system on 6/12/74 — no residual found

13. Specimens from patients examined (stool, vomitus, etc.) (68)

SPECIMEN	NO. PERSONS	FINDINGS
Example: Stool	11	8 *Salmonella typhi*
		3 negative

14. Unusual occurrence of events:
Example: Repair of water main 6/11/74; pit contaminated with sewage, no main disinfection. Turbid water reported by consumers 6/12/74.

15. Factors contributing to outbreak *(check all applicable)*:

- ☐ Overflow of sewage
- ☐ Seepage of sewage
- ☐ Flooding, heavy rains
- ☐ Use of untreated water
- ☐ Use of supplementary source
- ☐ Water inadequately treated
- ☐ Interruption of disinfection
- ☐ Inadequate disinfection
- ☐ Deficiencies in other treatment processes
- ☐ Cross-connection
- ☐ Back-siphonage
- ☐ Contamination of mains during construction or repair
- ☐ Improper construction, location of well/spring
- ☐ Use of water not intended for drinking
- ☐ Contamination of storage facility
- ☐ Contamination through creviced limestone or fissured rocl
- ☐ Other (specify) ______

16. Etiology: (69-70)
Pathogen ______
Chemical ______
Other ______

(71)
Suspected 1
Confirmed . . . . 2 *(Circle one)*
Unknown 3

17. Remarks: *Briefly describe aspects of the investigation not covered above, such as unusual age or sex distribution; unusual circumstances leading to contamination of water; epidemic curve; control measures implemented; etc. (Attack additional page if necessary)*

Name of reporting agency: (72)

Investigating Official: | **Date of investigation:**

Note: Epidemic and Laboratory assistance for the investigation of a waterborne outbreak is available upon request by the State Health Department to the Center for Disease Control, Atlanta, Georgia 30333.

To improve national surveillance, please send a copy of this report to: Center for Disease Control
Attn: Enteric Diseases Branch, Bacterial Diseases Division
Bureau of Epidemiology
Atlanta, Georgia 30333

Submitted copies should include as much information as possible, but the completion of every item is not required

CDC 4.461 (Back)
2-75

F. LINE LISTING OF WATERBORNE DISEASE OUTBREAKS, 1976

F. Line Listing of Waterborne Disease Outbreaks, 1976

State	Month	Disease	Cases	Type of System	Location of Outbreak	System Deficiency*
Alaska	August	*Shigella flexneri*	25	Municipal	Residence	1
Arkansas	July	Acute gastrointestinal illness	51	Semipublic	Camp	3
California	May	Acute gastrointestinal illness	60	Semipublic	Camp	4
California	May	Acute gastrointestinal illness	46	Municipal	Resort	2
California	July	Acute gastrointestinal illness	2	Municipal	Sewage Plant	5
Colorado	February	Giardiasis	12	Semipublic	Office, Residence	1
Colorado	May	Acute gastrointestinal illness	10	Semipublic	Restaurant	2
Colorado	June	Giardiasis	27	Semipublic	Camp	1
Colorado	December	Acute gastrointestinal illness	110	Semipublic	Camp	3
Connecticut	June	Acute gastrointestinal illness	300	Semipublic	Country Club	2
Florida	November	Acute gastrointestinal illness	31	Municipal	Residence	2
Idaho	June	Acute gastrointestinal illness	100	Semipublic	Camp	2
Massachusetts	July	Acute gastrointestinal illness	18	Semipublic	Park	2

Mississippi	October	Polychlorinated Biphenyls (PCB's)	20	Individual	Residence	2
New Jersey	October	Acute gastrointestinal illness	104	Semipublic	Restaurant	2
New York	March	*Salmonella typhimurium*	750	Municipal	Resort	4
Oklahoma	April	Acute gastrointestinal illness	65	Semipublic	School	2
Pennsylvania	April	Acute gastrointestinal illness	4	Semipublic	Recreational area	5
Pennsylvania	April	Acute gastrointestinal illness	30	Semipublic	Country Club	3
Pennsylvania	April	Lead poisoning	2	Individual	Residence	4
Pennsylvania	May	Acute gastrointestinal illness	35	Semipublic	Country Club	3
Pennsylvania	June	Acute gastrointestinal illness	10	Semipublic	Recreational area	2
Pennsylvania	June	Acute gastrointestinal illness	26	Semipublic	School, Church	3
Pennsylvania	June	Acute gastrointestinal illness	34	Semipublic	Camp	3
Pennsylvania	June	Acute gastrointestinal illness	5	Semipublic	Recreational area	2
Pennsylvania	July	Acute gastrointestinal illness	10	Semipublic	Restaurant	3
Pennsylvania	July	Acute gastrointestinal illness	150	Semipublic	Restaurant	2

*(1) Untreated surface water (2) Untreated ground water (3) Treatment deficiencies (4) Distribution system deficiencies (5) Miscellaneous

State	Month	Disease	Cases	Type of System	Location of Outbreak	System Deficiency*
Pennsylvania	July	Acute gastrointestinal illness	18	Semipublic	Restaurant	2
Pennsylvania	August	Acute gastrointestinal illness	10	Semipublic	Restaurant	2
Pennsylvania	October	Acute gastrointestinal illness	24	Individual	Residence	1
Pennsylvania	November	Acute gastrointestinal illness	66	Semipublic	Restaurant	3
Tennessee	March	Chlordane (pesticide)	13	Municipal	Residence	4
Vermont	February	Acute gastrointestinal illness	150	Municipal	Residence	3
Washington	May	Giardiasis	600	Municipal	Residence	3
Puerto Rico	July	*Shigella sonnei*	2,150	Municipal	Residence	3

*(1) Untreated surface water (2) Untreated ground water (3) Treatment deficiencies (4) Distribution system deficiencies (5) Miscellaneous

G. Selected Waterborne Outbreak Articles, 1976, Taken from Morbidity and Mortality Weekly Report

Waterborne Giardiasis Outbreaks--Washington, New Hampshire (MMWR 26(21):169, 1977

Two waterborne outbreaks of giardiasis have been reported to CDC in the past year. One occurred in Camas, Washington (pop. 6,000), in the spring of 1976; in this outbreak 128 people had laboratory-confirmed giardiasis. The other outbreak, still ongoing, is in Berlin, New Hampshire (pop. 15,000), where 205 people to date have developed confirmed giardiasis.

Camas: On May 6, 1976, the laboratory section of the Washington State Department of Social and Health Services contacted CDC to report a large number of *Giardia*-positive stools from Camas. Only 2 people from Camas had been stool-positive for *Giardia* in 1975, whereas the same laboratory had reported 32 positives in April and May of 1976. The 32 patients' residences were scattered throughout the town, and they had limited interpersonal contact, suggesting waterborne transmission. Therefore, an area of the city where half of the residents received Camas city water and the other half used private well water was chosen for a preliminary survey. Six of the 38 users of city water compared to none of 40 users of private water had an illness compatible with giardiasis ($p=0.01$), implicating waterborne transmission. A larger study was undertaken to define the extent and character of the outbreak.

Two mutually exclusive groups were investigated: those people who were ill and spontaneously sought medical care (hereafter called confirmed cases) and those people who were interviewed during a survey and found to be ill (clinical cases). The confirmed cases consisted of 128 people who voluntarily contacted their physicians reporting a diarrheal illness and were stool-positive for *Giardia*. Analysis of data obtained from confirmed cases and their medical records revealed that diarrhea for 10 or more days was the single statistically significant symptom. Among confirmed cases, the outbreak began during the first week in April and peaked the first week in May. The outbreak spontaneously declined on May 10, and on May 15 the city switched to well water exclusively to prevent any further exposures by surface water.

The second group consisted of the respondents to a randomized community questionnaire survey administered to 496 Camas residents and 318 residents in an adjacent control town (receiving only well water). Because diarrhea of 10 or more days was characteristic of confirmed cases it was used as the case definition to interpret the survey questionnaires. Nineteen people (4%) of Camas respondents fit the case definition for giardiasis; none did in the control town ($p=0.01$). Thus, at least 240 persons (clinical cases) were ill with giardiasis in Camas. The stools of 18 people - 9 well and 9 ill with any diarrheal illness - were examined; no viral or bacterial pathogens were found. Two of the ill persons (22%) and 1 of the not ill (11%) were stool-positive for *G. lamblia*. Giardiasis was not associated with pet ownership, travel, or recreational activities such as swimming which involve raw water.

Camas has 2 water sources - a pair of mountain streams and a set of deep wells. Those residents living in areas receiving less than 70% surface water (more than 30% well water) reported no cases, while those receiving more than 70% surface water had an attack rate of 4.7%. *Giardia* cysts were recovered from the raw surface water entering the city's water treatment plant. Because the city chlorinated and filtered its surface water supplies in a closed pressurized system, flocculation efficiency was marginal. Sedimentation could not be used. *Giardia* cysts were also recovered from 2 reservoirs holding water which had already passed through the water treatment facility (finished water). Deep well water used by the city was not contaminated. An investigation of the watershed revealed 2 remote mountain streams in a fenced area with no evidence of human contamination. Several animals near the watershed were trapped. Trapping yielded 9 negative animals (including coyote, opossum, nutria, porcupine, and beaver) and 3 positive beavers. The beavers lived in a pond bordering a heavily used state park, but were within foraging distance of the water intakes for Camas.

Berlin: On April 19, 1977, a medical technologist at a local hospital in Berlin called CDC to report that 10 cases of giardiasis had been diagnosed in the past 9 days. By April 26, New Hampshire had reported a total of 90 cases in comparison to no cases of giardiasis reported in Berlin in the previous 5 years. Because cases were randomly distributed throughout the community, waterborne transmission was suspected.

Again, 2 groups were investigated: those people who were ill, voluntarily sought medical care, and were stool-positive (confirmed cases) and those people who were interviewed during a survey and were found to be ill (clinical cases). As of May 20, there were 205 confirmed cases. The outbreak began on April 8 and peaked on April 25. On April 22, Berlin residents were instructed to boil drinking water, and the city increased its level of chlorination. However, approximately 5 people per day continue to be diagnosed as stool-positive for G. lamblia.

A randomized community questionnaire survey was done in Berlin (692 surveyed) and in an adjacent control town (286). One hundred sixty-five people (24%) in Berlin and 31 people (11%) in the control town reported diarrheal illness. However, because analysis of confirmed cases is not yet complete, the case definition for giardiasis in this outbreak has not been established. Therefore, the percentage of diarrheal illness attributable to Giardia infection has not yet been determined.

Berlin uses 2 rivers for its water supply: The Amonoosuc and the Androscoggin. People receiving Amonoosuc River water and those receiving Androscoggin River water had similar attack rates of diarrheal illness (23% vs. 27%, respectively). Giardia cysts have been recovered from the raw water from both rivers. Giardia cysts were recovered from 3 sites within the distribution system, including the regional hospital.

An investigation of the watershed revealed that the Amonoosuc River is a small stream located in the White Mountain National Forest. However, access is not restricted, and an estimated 3,000 people used the area for recreational activities during October, November, and December 1976. The water is chlorinated and filtered under pressure without sedimentation or flocculation. The physical plant is 30 years old, and 3 of its filters were badly worn. The Androscoggin River receives untreated sewage effluent from a number of homes in 2 communities upstream from Berlin. Because of the known sewage contamination of the Androscoggin, a new water treatment plant was put in service on March 10, 1977. However, because of cross connections secondary to faulty construction and difficulty creating the proper weight floc, the new plant was ineffective. The town is repairing the plant.

Editorial Note: An outbreak of giardiasis in Rome, New York, in the spring of 1975 was the first laboratory-documented epidemic of waterborne giardiasis in the United States; it affected over 4,800 people (MMWR 24:(43), 1977). The outbreak the following spring in Camas, where at least 240 people developed giardiasis, again demonstrated the ability of Giardia organisms to cause citywide outbreaks of diarrhea. Significant morbidity was demonstrated, as the illness produced was characterized by prolonged diarrhea (≥ 10 days).

In Rome, the absence of filtration and optimum chlorination left the city unprotected against waterborne giardiasis. In Camas and in Berlin (on the Amonoosuc), pressure filters without sedimentation and proper flocculation failed to remove Giardia cysts. The Androscoggin water treatment plant in Berlin has sedimentation flocculation and rapid sand filters; however, flocculation difficulties and cross connections between unfiltered and finished water decreased the plant's effectiveness. Nevertheless, it has been shown that properly functioning sedimentation, flocculation, and filtration will remove particles the size of Giardia cysts from water, and thus can provide safe drinking water in distribution systems utilizing surface water (1).

Reference

1. Fair GM, Geyer JC: Water Supply and Waste-Water Disposal. New York, John Wiley & Son, Inc., 1956

Probable Viral Gastroenteritis--Colorado
(MMWR 26(3):13, 1977)

An outbreak of probable waterborne viral gastroenteritis occurred during the week before Christmas among vacationers at a winter resort near Granby, Colorado. Over 700 persons were registered at the camp during the outbreak. Of 208 surveyed thus far, 53% reported symptoms of nausea, vomiting, or diarrhea. Secondary transmission appears to have occurred.

Most visitors left the camp on December 22 or 23 aboard charter buses with final destinations in Arkansas, Colorado, Mississippi, Missouri, Nebraska, and Texas. Explosive diarrhea and vomiting aboard the buses caused some groups to seek medical attention in hospital emergency rooms along the way. One group from Jackson, Mississippi, stopped in Dallas, Texas, where 60 members were seen in a single emergency room within several hours. A Beaumont, Texas, group stopped in a Denver, Colorado, hospital with approximately half its members ill with gastroenteritis. Six of the emergency room nurses caring for this group developed similar symptoms within 24 hours.

The only complete data gathered to date have been obtained from a questionnaire survey of camp personnel to which over 90% responded. The attack rate among them was 51%, with a sharp peak in the number of cases on December 23 (Figure 3). No significant differences were found between males and females. Meals consumed in the 3-camp dining rooms, serviced by a central kitchen, could not be implicated. The most common symptoms were vomiting (77%) and diarrhea (66%). Nausea without vomiting occurred in 14% (Table 6). There was no mortality. The secondary attack rate among family members of camp staff appeared to be greater than 25%. Numerous stool specimens were negative for common bacterial enteric pathogens.

Because of the widespread nature of the epidemic in the 2,500-acre camp, the occurrence of most cases over a 48-hour period, and the lack of correlation with food consumption, waterborne disease was considered. The camp is supplied with water by a natural spring in a meadow at low elevation. Water is pumped from the spring upward to the camp, and finally to a reservoir which is at still higher elevation. During heavy usage periods, the reservoir is capable of supplying water to 30 cabins by gravity. The pump house over the spring is located at the base of a small hill on top of which is located a private cabin with an attached septic tank, installed in 1959. Interviews with maintenance personnel revealed that on December 22 they discovered malfunctioning of the chlorinator and subsequently turned it off for several hours while making repairs.

On January 6 a survey of 100 guests at the camp revealed an incidence of gastroenteritis of 14% over the preceding 4-day period. Fluorescein dye flushed into the cabin sewage system rapidly appeared in the spring and in the camp tap water. The septic tank, covered by 2 feet of soil and set in fractured shale and decomposed granite, was subsequently unearthed, and a 3" x 4" hole was found in the leaching pipe several feet from its exit from the tank and directly above the pump house, at a distance of about 50 feet.

On the next day it was recommended that the camp's main water system (derived from the spring) be shut off and an auxiliary well chlorinated to provide potable water to the core buildings. All of the outlying cabins were closed. The septic tank was removed and daily monitoring of coliform count and chlorine residual was instituted.

The investigation is continuing to characterize the disease among visitors and to determine the extent of secondary transmission. Viral laboratory studies are also pending.

Editorial Note: Investigation of waterborne outbreaks of gastroenteritis often does not reveal an etiologic agent. From 1961 through 1972, gastroenteritis unassociated with known pathogens accounted for 45% of 49 municipal waterborne outbreaks investigated by CDC. The 1968 outbreak of gastroenteritis in Norwalk, Ohio, was theorized on epidemiologic grounds to be waterborne (1). In 1971 the causative agent, a

parvovirus, was identified by electronmicroscopy after transmission to volunteers. However, waterborne viral gastroenteritis has not been documented by recovery of virus from primary cases or from water.

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Fig. 3 PROBABLE VIRAL GASTROENTERITIS, COLORADO, DECEMBER 1976

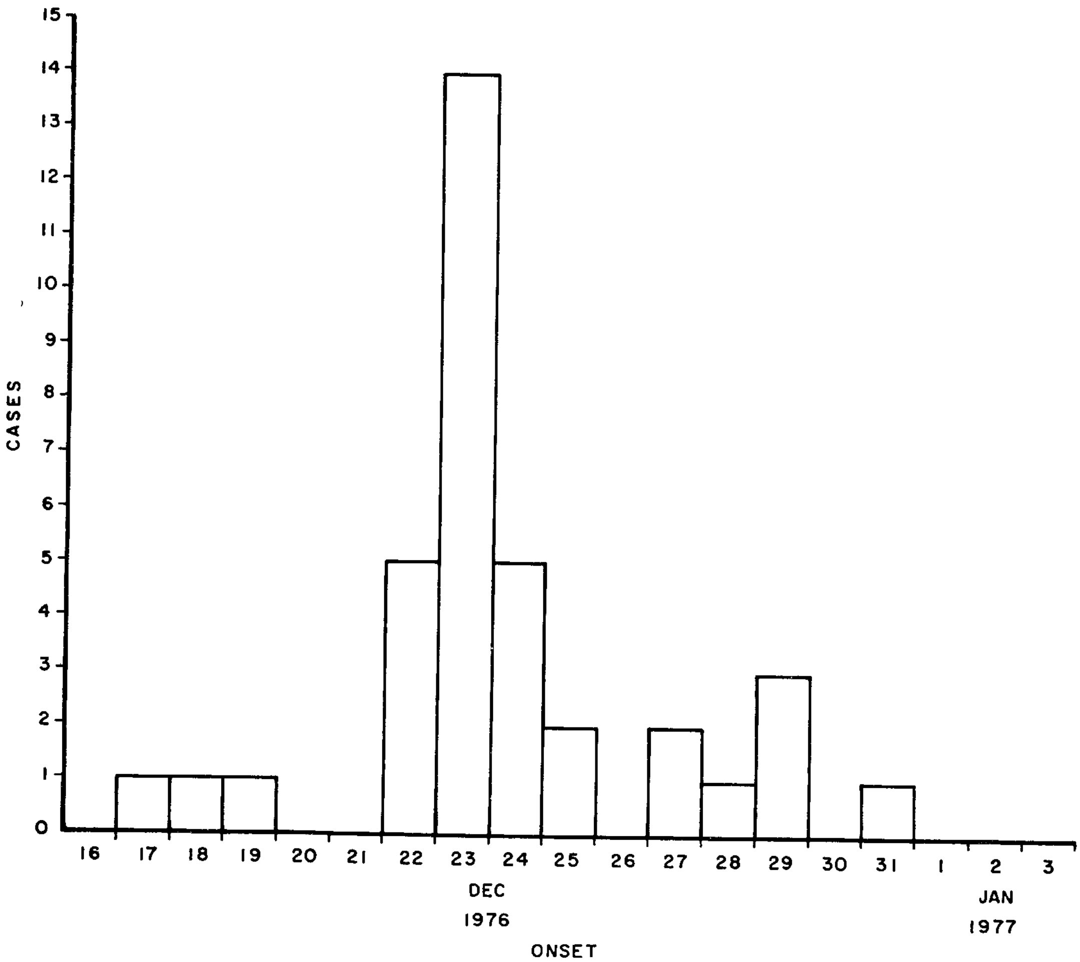

Table 6

Clinical Symptoms in 36 Camp Staff with Gastroenteritis

Symptoms	% Ill
Vomiting	77
Diarrhea	66
Muscle Aches	49
Headache	43
Dizziness	40
Abdominal Cramps	37
Fever	34
Chills	31
Nausea Without Vomiting	14
Bloody Diarrhea	0

IV. OUTBREAKS ON CRUISE SHIPS AND AIRCRAFT

This report summarizes data on outbreaks of gastrointestinal illness on cruise ships or aircraft that were reported to CDC in 1976.

A. Definition of Outbreak

Diarrheal illness on passenger vessels (vessels with 13 or more passengers) are reported by the Quarantine Stations to the Enteric Diseases Branch if 1) three percent or more of passengers or crew are ill; 2) one or more passengers or crew members is ill and the vessel has been in a cholera-infected area within the previous 5 days; 3) there has been a death or hospitalization aboard the vessel in a person who had a diarrheal illness.

After such an incident is reported, the need for a full investigation is determined by the severity, timing, and magnitude of the problem. The outbreaks tabulated in this report (Table 7) are the incidents that have been fully investigated by CDC. These investigations usually included, questionnaire surveys of passengers and crew, detailed evaluation of sanitation, and laboratory analysis of food, water, environment, and patient specimens. The Quarantine Division evaluated 6 additional incidents with medical log reviews and environmental inspections only.

Table 7

Outbreaks of Gastrointestinal Illness on Cruise Ships, 1976

Vessel	Date	Port	Length of Cruise (Days)	Number of Passengers	Percent of Passengers Ill	Etiology	Vehicle
A	June	Miami	14	745	35%	Unknown	Unknown
B	September	Miami	14	582	56%	Unknown	Water

B. Analysis of Data

In 1976 diarrhea outbreaks were investigated on 2 cruises (Table 7) and 1 aircraft (Table 8). The shipboard outbreaks occurred on the same ship during 2 separate Caribbean cruises (June and September). The investigation of the September cruise demonstrated coliform bacteria (TNTC) in the potable water system. Sewage contamination of the bunkered potable water had occurred. Potable water samples taken both before and after passing the U.V. light purifying system were found contaminated with coliform bacteria. There was no direct explanation for the coliform bacteria in the potable water system immediately after it passed through the U.V. system. Two possible explanations for this contamination were: 1) undiscovered cross connections existed in the potable water lines that by-passed the U.V. system (unlikely), or 2) coliform bacteria survived passage through the U.V. system.

Table 8

Outbreaks of Gastrointestinal Illness Aboard Aircraft, 1976

Aircraft	Date	Point of Embarkation	Point of Disembarkation	Number of Passengers	Percent of Passengers Ill	Etiology	Vehicle
A	6-20	Rio de Janeiro, Brazil	New York City, New York	185	15	Staphylococcal enterotoxin type D	Chocolate eclairs

The 1 reported outbreak on an aircraft took place on an American carrier enroute from Rio de Janeiro, Brazil, to New York City. Chocolate eclairs, consumed aboard the flight, were found to be contaminated with type D staphylococcal enterotoxin; they were prepared in Rio de Janeiro, and had been left unrefrigerated for 10 hours before being placed aboard the aircraft. A diversionary stop in San Juan, Puerto Rico, was necessary to discharge ill passengers.

The marked decline in cruise vessel diarrheal outbreaks (8 in 1975) may be attributed to the cruise vessel sanitary inspection program which has been rigorously administered since 1974. All vessels with a home port in the United States receive a semiannual inspection. Vessels failing to meet the U.S. Public Health Service Standards are reinspected frequently until standards are achieved. Vessels meeting the standards have unscheduled spot inspections between semiannual inspections to insure that high sanitary standards are maintained.

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VI. ARTICLES ON FOODBORNE AND WATERBORNE DISEASE OUTBREAKS, 1976, TAKEN FROM MORBIDITY AND MORTALITY WEEKLY REPORT

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WATERBORNE DISEASE

STATE EPIDEMIOLOGISTS AND STATE LABORATORY DIRECTORS

The State Epidemiologists are the key to all disease surveillance activities. They are responsible for collecting, interpreting, and transmitting data and epidemiologic information from their individual states. Their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors; we are indebted to them for their valuable support.

STATE	STATE EPIDEMIOLOGIST	STATE LABORATORY DIRECTOR
Alabama	Frederick S Wolf, MD	Thomas S Hosty, PhD
Alaska	John Starr, MD	Frank P Pauls, DrPH
Arizona	Alexander Kelter, MD	Jon M Counts, DrPH
Arkansas	Paul C White, Jr, MD	Robert T Howell, DrPH
California	James Chin, MD	John M Heslep, PhD
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Minnesota	Ellen Z Fifer, MD	David Stickle, DrPH, Acting
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Washington	Jack Allard, PhD*	Jack Allard, PhD*
West Virginia	William L Cooke, MD	John W Brough, DrPH
Wisconsin	H Grant Skinner, MD	S L Inhorn, MD
Wyoming	Herman S Parish, MD	Donald T Lee, DrPH

*Dual assignment

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