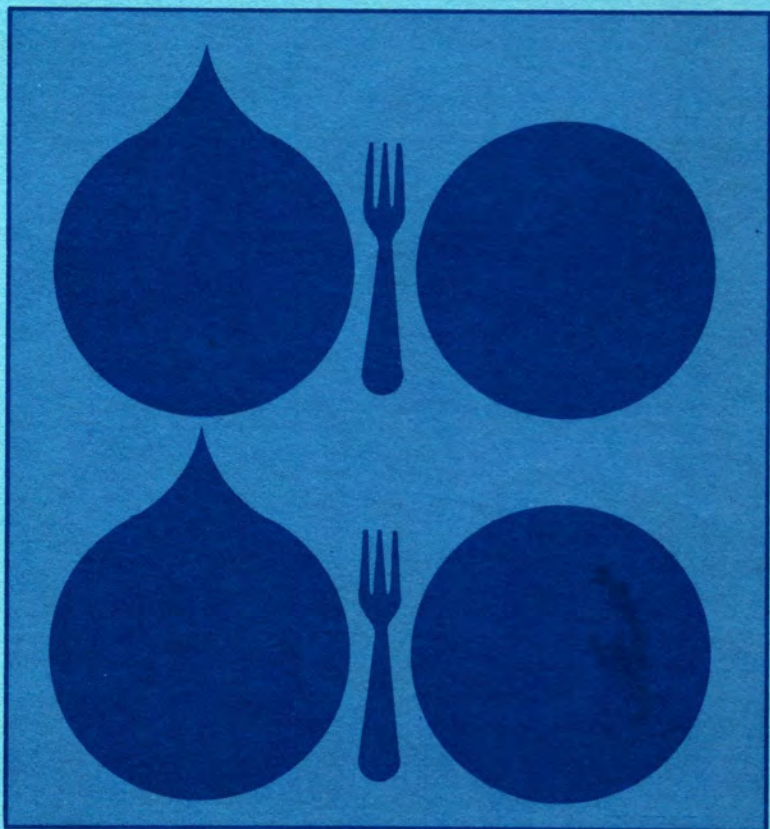
ANNUAL SUMMARY 1977
ISSUED AUGUST 1979

CENTER FOR DISEASE CONTROL

Foodborne & Waterborne Disease

SURVEILLANCE



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service

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

SUGGESTED CITATION

Center for Disease Control: Foodborne and Waterborne Disease Outbreaks Annual Summary 1977. Issued Aug. 1979

TABLE OF CONTENTS

HEW Publication No. (CDC) 79-8185

ACKNOWLEDGMENTS: We acknowledge the important role played by Richard Swanson, B.S., and Daniel Brand, B.S., of the Field Investigations Branch, Food and Drug Administration, and John Prucha, D.V.M., of the Animal and Plant Health Inspection Service, U.S. Department of Agriculture, in alerting the Enteric Diseases Branch to foodborne disease outbreaks which came to their attention.

We also acknowledge the invaluable assistance of Gunther F. Craun, M.S., Water Quality Division, Health Effects Research Laboratory, Environmental Protection Agency, in collecting and reviewing waterborne disease outbreak data. Special thanks to Ellen Montgomery, Cheryl Giddens, and Lynn Miller for their secretarial assistance in preparing this report.

I. SUMMARY

In 1977 there were 436 outbreaks of foodborne disease involving 9,896 cases reported to the CDC Foodborne Disease Surveillance Activity. Etiology was confirmed in 36% (157) of the outbreaks; the majority (101) were caused by bacterial agents.

II. 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. Included in this report are data from foodborne and waterborne disease outbreaks reported to CDC in 1977.

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 that result from surveillance of foodborne disease. Identification of contaminated water sources and adequate purification of water from 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 known to be 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*, *Campylobacter*, *Citrobacter*, *Enterobacter*, *Klebsiella*, *Pseudomonas*, and the presumably viral agents of acute infectious nonbacterial gastroenteritis (e.g., rotavirus, parvovirus-like agents). 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 roles 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 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.

III. 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 illness--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).

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, which in turn, report to FDA or USDA any foodborne disease outbreaks that 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 1977, 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 1 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 toxins 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 final 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 toxins 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 the problems involved in the transport and culturing of the anerobic specimens. Outbreaks of B. cereus, E. coli, V. parahaemolyticus, and Y. enterocolitica food poisoning 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. If a microbiologist becomes interested in looking for C. perfringens or V. parahaemolyticus, he is likely to confirm more outbreaks of these etiologies.

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).

Deaths associated with foodborne disease are frequently unreported. 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 (Table 5). In these outbreaks when the epidemiology incriminating a particular food item was very weak, the food was listed as unknown (Table 6). In these outbreaks information on the place of acquisition 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 information about contributing factors in foodborne disease is available. 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 contribute 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. Analysis of Data

In 1977 there were 436 outbreaks of foodborne disease involving 9,896 cases, a decrease of 1 outbreak reported to the CDC Foodborne Disease Surveillance Activity for the previous year (Figure 1). The etiology was confirmed in 36% (157) of the outbreaks--similar to the percentage of outbreaks with confirmed etiologies for 1976 (30%) and 1975 (38%).

Outbreaks were reported from 43 states, New York City, Puerto Rico, Guam, and the Virgin Islands (Figure 2 and Table 1). No outbreaks were reported from 7 states or the Canal Zone. Two outbreaks involved more than 1 state. The 4 state health departments reporting the largest number of outbreaks were California (55); Washington (45); New York (40); and Pennsylvania (28). The number of outbreaks reported from these states undoubtedly reflects the interest of the respective state health departments in foodborne disease surveillance.

Of the 157 outbreaks with confirmed etiology, the etiology was bacterial in 101 (64%), chemical in 37 (24%), parasitic in 15 (10%), and viral in 4 (3%) (Table 2). While outbreaks with known bacterial etiology accounted for only 64% of the outbreaks, they accounted for 85% of the cases. The majority of cases of bacterial etiology were caused by *Salmonella* (42%) and *Staphylococcus* (22%). The botulism cases were the most reported since 1919. This primarily reflects the large outbreak which occurred in Michigan.

No outbreaks (2 or more cases) of foodborne brucellosis were reported in 1977. However, 15 sporadic brucellosis cases were attributed to the ingestion of unpasteurized dairy products. Four cases were traced to milk produced in the United States, and 11 were attributed to foreign dairy products. The foreign dairy products included milk and cheese.

In 1977 there were 8 deaths associated with foodborne outbreaks (Table 4). Five deaths were attributed to eating food containing the toxin of *C. botulinum*, for a case-fatality ratio of 6.7% (5/75). The other 3 deaths associated with foodborne outbreaks occurred in individuals consuming herbal teas.

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 the 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 *C. perfringens* then these agents were responsible for substantially more outbreaks than suggested in Table 2.

The vehicles of transmission were identified in 267 (61%) of the outbreaks (Table 6); multiple vehicles were involved in 29 (6.7%). Of the 338 outbreaks in which a single vehicle was identified, meats or poultry were incriminated in 74 (31%), oriental food 32 (12%), salads including chicken, turkey, potato, and egg in 12 (5%), fish or shellfish in 31 (12%), dairy products in 7 (3%), fruits and vegetables in 8 (3%), mushrooms 5 (2%), and other foods in 23 (9%). Of the meat vehicles beef, ham, and sausage were most frequently incriminated.

Outbreaks of C. botulinum frequently involved home preserved vegetables, 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 non-dairy beverages. Ciguatera outbreaks involved mainly coral reef fish (grouper). T. spiralis outbreaks usually involved pork or sausage.

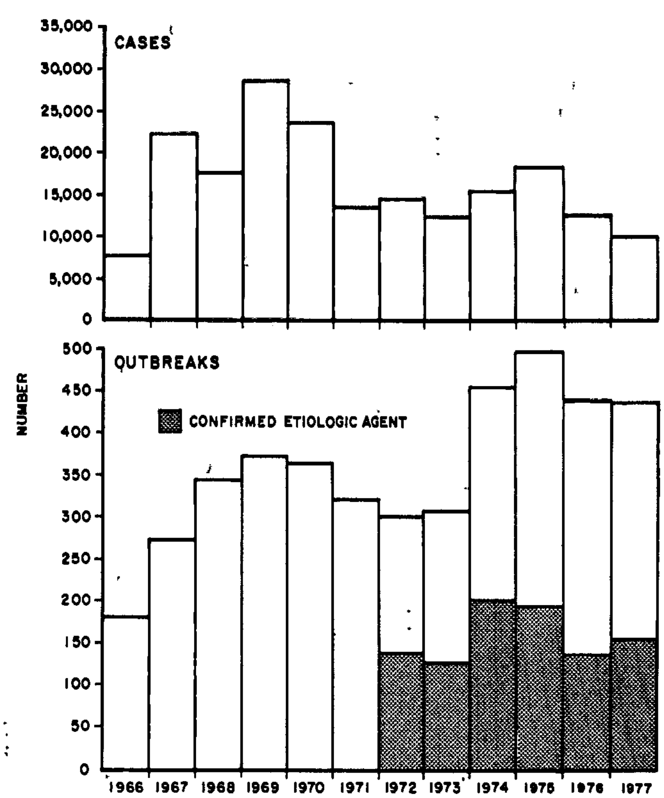
In three-fourths of the outbreaks, the food was eaten at home (25%) or in a restaurant (48%) (Table 7). Of the 20 outbreaks of botulism, the food was eaten at home in 16 (80%), in a restaurant 1 (5%), and was unknown in 3 (15%). Chemical outbreaks occurred frequently in the home and in food service establishments. 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 393 outbreaks (Table 8). Of these, food service establishments were specified as responsible for the mishandling of food in 73%, homes in 25%, and food processing establishments in 2%. 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 marketing. The distribution of places that were responsible for mishandling of food in 1977 paralleled that of the 2 previous years. As in 1975 and 1976, 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 food service establishments. In ciguatera 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 outside the home.

Of the 8 outbreaks attributed to mishandling of food in food processing establishments, 6 were due to bacteria and 2 to chemicals (Table 9). In 273 (63%) of the 436 outbreaks, including 123 (78%) of the 157 confirmed outbreaks, a contributing factor was reported (Table 10). The 1977 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 and mushroom poisoning, the food was originally unsafe. In the outbreaks of chemical poisoning caused by miscellaneous chemicals, the food was obtained from an unsafe source. In the 4 outbreaks of hepatitis, a person suspected of having active hepatitis was involved in food handling.

The date of onset of an outbreak was designated as the date of onset of the

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



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.

Fig. 2 REPORTED FOODBORNE DISEASE OUTBREAKS, 1977

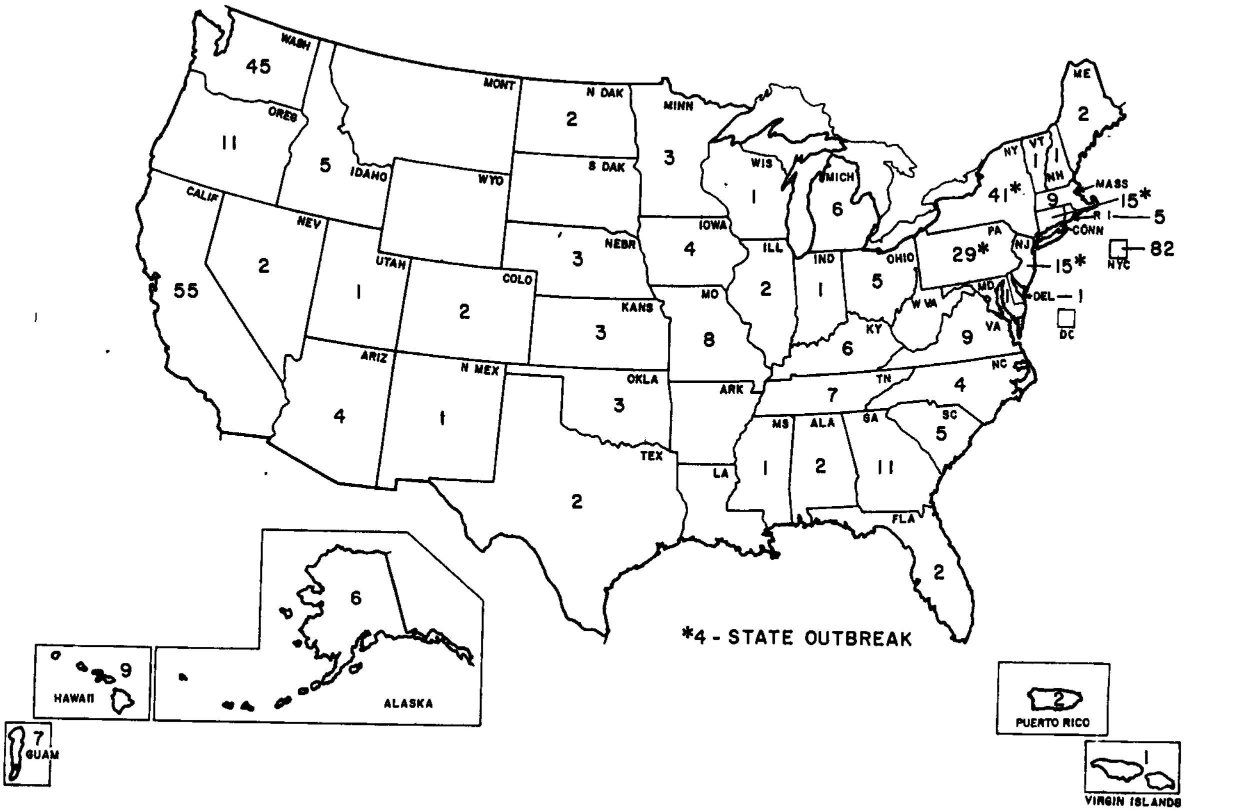


Table 1
Foodborne Disease Outbreaks, by Location, 1975-1977

State	1975	1976	1977	State	1975	1976	1977
Alabama	1	1	2	Missouri	8	2	7
Alaska	4	11	6	Montana	3	2	0
Arizona	2	2	4	Nebraksa	3	4	3
Arkansas	2	0	0	Nevada	4	3	2
California	41	26	55	New Hampshire	2	1	1
Colorado	1	7	2	New Jersey	12	8	14
Connecticut	9	9	14	New Mexico	1	1	1
Delaware	1	1	1	New York City	120	119	82
District of Columbia	0	2	0	New York State	8	19	40
Florida	30	4	2	North Carolina	0	1	4
Georgia	17	7	11	North Dakota	0	2	2
Hawaii	15	17	9	Ohio	0	9	4
Idaho	0	5	5	Oklahoma	3	3	3
Illinois	12	5	1	Oregon	7	5	11
Indiana	4	0	0	Pennsylvania	21	41	28
Iowa	1	1	4	Puerto Rico	0	1	2
Kansas	0	1	3	Rhode Island	2	2	5
Kentucky	8	2	5	South Carolina	9	2	5
Louisiana	15	3	0	South Dakota	1	0	0
Maine	0	2	2	Tennessee	17	8	7
Maryland	2	0	1	Texas	3	5	2
Massachusetts	8	10	9	Utah	3	1	1
Michigan	5	5	6	Vermont	0	0	1
Minnesota	25	7	3	Virginia	4	5	9
Mississippi	1	2	1	Washington	44	48	45
Other				West Virginia	0	0	0
Virgin Islands	0	1	1	Wisconsin	13	9	1
Guam and Trust Territories	2	2	7	Wyoming	1	0	0
				Multiple	2	3	2*,**

*Connecticut, New Jersey, New York, Pennsylvania
**Illinois, Indiana, Kentucky, Missouri, Ohio

1975 total	497
1976 total	437
1977 total	436

Table 2

Confirmed Foodborne Disease Outbreaks and Cases by Etiology, 1977

		Outbreaks #	Outbreaks %	Cases #	Cases %
BACTERIAL					
A. hinshawii		1	0.6	13	0.3
C. botulinum		20	12.7	75	1.8
C. perfringens		6	3.8	568	13.9
Salmonella		41	26.1	1706	41.9
Shigella		5	3.2	67	1.6
Staphylococcus		25	15.9	905	22.2
V. cholerae (not 01)		1	0.6	2	0.0
V. parahaemolyticus		2	1.3	118	2.9
	Total	101	64.2	3454	84.6
CHEMICAL					
Heavy metal		8	5.1	326	8.0
Ciguatoxin		3	1.9	22	0.5
Scombrotoxin		13	8.3	71	1.7
Monosodium glutamate		2	1.3	11	0.3
Mushroom poison		5	3.2	14	0.3
Other chemicals		6	3.8	11	0.3
	Total	37	23.6	455	11.1
PARASITIC					
T. spiralis		14	8.9	87	2.1
Anisakidae		1	0.6	4	0.1
	Total	15	9.5	91	2.2
VIRAL					
Hepatitis A		4	2.5	72	1.8
	Total	4	2.5	72	1.8
CONFIRMED TOTAL		157	99.8	4072	99.7

Table 3

Confirmed Foodborne Disease Outbreaks and Cases, 1975-1977

	No. of Outbreaks (No. of Cases)		
	1975	1976	1977
BACTERIAL			
A. hinshawii	1(15)	0(0)	1(13)
B. cereus	3(45)	2(63)	0(0)
C. botulinum	14(19)	23(40)	20(75)
C. perfringens	16(419)	6(509)	6(568)
Salmonella	38(1,573)	28(1,169)	41(1706)
Shigella	3(413)	6(273)	5(67)
Staphylococcus	45(2,275)	26(930)	25(905)
V. cholerae (not 01)	0(0)	0(0)	1(2)
V. parahaemolyticus	2(222)	0(0)	2(118)
Suspect Group D Streptococcus	1(50)	0(0)	0(0)
Y. enterocolitica	0(0)	1(286)	0(0)
Total	123(5,031)	92(3,270)	101(3454)
CHEMICAL			
Heavy metals	4(50)	6(55)	8(326)
Ciguatoxin	19(70)	6(19)	3(22)
Scombrotoxin	6(16)	2(5)	13(71)
Monosodium glutamate	3(9)	2(7)	2(11)
Mushroom poison	5(5)	1(1)	5(14)
Paralytic shellfish poison	0(0)	4(11)	0(0)
Miscellaneous chemicals	6(38)	7(59)	6(11)
Total	43(188)	28(157)	37(455)
PARASITIC			
T. spiralis	20(193)	8(27)	14(87)
Anisakidae	1(1)	0(0)	1(4)
D. latum	1(1)	0(0)	0(0)
*E. histolytica	0(0)	0(0)	0(0)
Total	22(195)	8(27)	15(91)
VIRAL			
Hepatitis A	3(173)	2(37)	4(72)
Echo, type 4	0(0)	1(80)	0(0)
Total	3(173)	3(117)	4(72)
CONFIRMED TOTAL	191(5,587)	131(3571)	157(4,072)

*Outbreak previously reported in 1976 could not be confirmed as foodborne

Table 4

Deaths Associated with Foodborne Outbreaks, 1975-1977

	1975	1976	1977
C. botulinum	2	5	5
C. perfringens	1	0	0
Salmonella	2	3	0
Shigella	0	1	0
Staphylococcus	0	0	0
V. cholerae	0	0	0
T. spiralis	1	0	0
Mushroom poison	2	0	0
Organic chemicals	0	0	3
Unknown	2	1	0
Total	10	10	8

Table 5

Foodborne Disease Outbreaks of Unknown Etiology, by Incubation Period, 1977

Incubation Period	Number of Outbreaks	Percent of Total Outbreaks
<1 hour	15	3.4
1-7 hours	129	29.6
8-14 hours	69	15.8
>15 hours	53	12.2
Unknown	13	3.0
Total	279	64.0

Table 6

Foodborne Disease Outbreaks, by Vehicle of Transmission, and Specific Etiology, 1977

	Beef	Lamb	Ham	Pork	Sausage	Chicken	Turkey	Other Meat	Shellfish	Mahi-Mahi	Other Fish	Milk	Cheese	Ice Cream	Other Dairy Products	Baked Foods	Fruits & Vegetables	Potato Salad	Poultry, Fish, Egg Salad	Other Salads	Mushrooms	Chinese Food	Mexican Food	Non-Dairy Beverages	Multiple Vehicles	Other Foods	Unknown	Total
BACTERIAL																												
A. hinshawii	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	1	1
C. botulinum	_	_	_	_	_	_	_	4	_	_	3	_	_	_	_	_	6	_	_	_	_	_	_	_	_	1	6	20
C. perfringens	1	_	_	_	_	_	2	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	2	_	_	_	1	6
Salmonella	11	_	_	2	_	3	3	1	_	_	_	_	1	3	_	1	1	_	3	_	_	_	_	_	3	4	5	41
Shigella	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	1	_	_	_	_	_	_	1	_	2	_	_	5
Staphylococcus	1	1	9	1	1	3	1	_	1	_	_	_	_	_	1	1	_	1	1	_	_	_	_	_	1	1	1	25
V. cholerae(not 01)	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	1
V. parahaemolyticus	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	_	_	2
CHEMICAL																												
Heavy metal	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	8	_	_	_	8
Ciguatoxin	_	_	_	_	_	_	_	_	_	_	3	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	3
Scombrotoxin	_	_	_	_	_	_	_	_	_	3	10	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	13
Monosodium glutamate	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	2	_	_	_	_	_	2
Mushroom poison	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	5	_	_	_	_	_	_	5
Other chemicals	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	2	_	4	_	6
PARASITIC																												
T. spiralis	_	_	_	4	9	_	_	1	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	14
Anisakidae	_	_	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	1
VIRAL																												
Hepatitis A	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	1	_	2	4
CONFIRMED TOTAL	13	1	9	7	10	6	6	6	5	3	17	_	1	3	1	3	7	1	5	_	5	2	3	10	7	10	16	157
UNKNOWN	14	_	1	1	_	_	2	3	7	_	2	_	_	1	2	9	2	1	5	6	_	30	14	2	12	12	153	279
TOTAL	27	1	10	8	10	6	8	9	12	3	19	_	1	4	3	12	9	2	10	6	5	32	17	12	19	22	169	436

Table 7

Foodborne Disease Outbreaks, by Place Where Food was Eaten, and Specific Etiology, 1977

	Home	Restaurant	School	Picnic	Church	Camp	Other or Unknown	Total
BACTERIAL								
A. hinshawii	—	—	—	1	—	—	—	1
C. botulinum	16	1	—	—	—	—	3	20
C. perfringens	—	1	2	1	—	—	2	6
Salmonella	12	10	2	3	—	1	13	41
Shigella	2	—	1	—	—	—	2	5
Staphylococcus	6	8	3	2	—	—	6	25
V. cholerae (not 01)	1	—	—	—	—	—	—	1
V. parahaemolyticus	—	—	—	—	—	—	2	2
Total	37	20	8	7	—	1	28	101
CHEMICAL								
Heavy metal	—	4	1	—	1	—	2	8
Ciguatoxin	3	—	—	—	—	—	—	3
Scombrotoxin	3	9	—	—	—	—	1	13
Monosodium glutamate	—	2	—	—	—	—	—	2
Mushroom poison	4	—	1	—	—	—	—	5
Other chemicals	4	2	—	—	—	—	—	6
Total	14	17	2	—	1	—	3	37
PARASITIC								
T. spiralis	13	—	—	1	—	—	—	14
Anisakidae	1	—	—	—	—	—	—	1
Total	14	—	—	1	—	—	—	15
VIRAL								
Hepatitis A	1	2	—	—	—	—	1	4
Total	1	2	—	—	—	—	1	4
CONFIRMED TOTAL	66	39	10	8	1	1	32	157
UNKNOWN	42	170	12	6	1	2	46	279
Total 1977	108	209	22	14	2	3	78	436
Total 1976	107	180	24	11	6	2	108	438
Total 1975	137	196	29	12	16	5	102	497

Table 8

Foodborne Disease Outbreaks, by Specific Etiology and Place Where Food Was Mishandled, 1977

BACTERIAL	Food Processing Establishments	Food Service Establishments	Homes	Unknown-Unspecified	Not Applicable	Total
A. hinshawii	-	-	1	-	-	1
C. botulinum	-	1	17	2	-	20
C. perfringens	-	6	-	-	-	6
Salmonella	4	19	13	5	-	41
Shigella	-	3	2	-	-	5
Staphylococcus	1	16	6	2	-	25
V. cholerae (not01)	-	-	1	-	-	1
V. parahaemolyticus	-	2	-	-	-	2
Total	5	47	40	9	-	101
CHEMICAL						
Heavy metal	-	8	-	-	-	8
Ciguatoxin	-	-	-	-	3	3
Scombrotoxin	2	7	1	3	-	13
Monosodium glutamate	-	2	-	-	-	2
Mushroom poison	-	-	4	-	1	5
Other chemicals	1	2	3	-	-	6
Total	3	19	8	3	4	37
PARASITIC						
T. spiralis	-	-	14	-	-	14
Anisakidae	-	-	-	1	-	1
Total	-	-	14	1	-	15
VIRAL						
Hepatitis A	-	4	-	-	-	4
Total	-	4	-	-	-	4
CONFIRMED TOTAL	8	70	62	13	4	157
UNKNOWN	0	218	35	26	0	279
Total 1977	8	288	97	39	4	436
Total 1976	15	294	67	53	9	438
Total 1975	13	201	61	222	0	497

Table 9

Foodborne Disease Outbreaks Caused by Mishandling of Food in Food-Processing Establishments 1977

Etiology	Vehicle	Number of Cases
Salmonella infantis	Barbecued pork	17
S. newport	Precooked roast beef	200
S. typhimurium	Cake icing	3
S. typhimurium	Precooked roast beef	8
Staphylococcus Enterotoxin A	Whipped butter	100
Senecio longilobus	Herbal tea	1
Scombrotoxin	Tuna	13*

Total	1977	8 outbreaks	342 cases
	1976	15 outbreaks	1283 cases
	1975	13 outbreaks	123 cases

*2 outbreaks

Table 10

Foodborne Disease Outbreaks, by Etiology and Contributing Factors, 1977

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								
A. hinshawii	1	1	1					
C. botulinum	20	18	5	15	1	1	—	1
C. perfringens	6	6	6	1	2		2	
Salmonella	41	24	18	8	7	6	7	4
Shigella	5	3					3	
Staphylococcus	25	19	18	3	11	1	11	4
V. cholerae (not 01)	1	1		1	—	1	—	—
V. parahaemolyticus	2	2	2	1	—	—	—	—
Total	101	74	50	29	21	9	23	9
CHEMICAL								
Heavy metal	8	8	—	—	3	—	—	5
Ciguatoxin	3	1	—	—	—	—	—	1
Scombrotoxin	13	9	6	—	1	—	—	3
Monosodium glutamate	2	1	—	—	—	—	—	1
Mushroom poison	5	5	—	—	—	5	—	—
Other chemicals	6	6	—	—	2	1	—	6
Total	37	30	6	—	6	6	—	16
PARASITIC								
T. spiralis	14	14	—	14	—	1	—	—
Anisakidae	1	1	—	1	—	—	—	—
Total	15	15	—	15	—	1	—	—
VIRAL								
Hepatitis A	4	4	1	—	1	—	4	—
Total	4	4	1	—	1	—	4	—
CONFIRMED TOTAL	157	123	57	44	28	16	27	25
UNKNOWN	279	150	111	23	30	7	60	21
Total 1977	436	273	168	67	58	23	87	46
1976	438	242	160	43	54	17	53	44
1975	497	277	214	87	62	14	93	14

Table 11

Foodborne Disease Outbreaks, by Month of Occurrence, and Specific Etiology, 1977

BACTERIAL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. hinshawii	—	—	—	—	—	—	1	—	—	—	—	—	1
C. botulinum	3	2	1	—	3	—	—	1	1	4	1	3	20
C. perfringens	1	1	—	—	1	—	—	—	1	—	1	1	6
Salmonella	1	2	1	4	6	4	1	12	8	1	—	1	41
Shigella	—	—	—	—	—	1	—	2	1	—	—	1	5
Staphylococcus	2	—	3	3	2	4	4	3	—	3	—	1	25
V. cholerae (not 01)	—	—	—	—	1	—	—	—	—	—	—	—	1
V. parahaemolyticus	—	—	—	—	—	—	—	—	—	1	—	1	2
Total	7	5	5	7	13	9	7	18	11	9	2	8	101
CHEMICAL													
Heavy metal	—	1	2	1	1	1	—	—	—	1	1	—	8
Ciguatoxin	—	1	—	—	—	1	—	—	—	1	—	—	3
Scombrotoxin	—	1	—	—	—	—	—	8	1	1	1	1	13
Monosodium glutamate	—	1	—	—	—	—	—	—	—	—	—	1	2
Mushroom poison	—	—	—	1	—	—	—	2	—	1	—	1	5
Other chemicals	2	—	1	—	1	—	—	—	—	1	—	1	6
Total	2	4	3	2	2	2	—	10	1	5	2	4	37
PARASITIC													
T. spiralis	4	1	2	—	—	—	1	1	1	—	3	1	14
Anisakidae	—	—	1	—	—	—	—	—	—	—	—	—	1
Total	4	1	3	—	—	—	1	1	1	—	3	1	15
VIRAL													
Hepatitis A	—	—	1	—	1	1	—	—	—	1	—	—	4
Total	—	—	1	—	1	1	—	—	—	1	—	—	4
CONFIRMED TOTAL	13	10	12	9	16	12	8	29	13	15	7	13	157
UNKNOWN	21	16	19	24	20	21	29	25	27	18	24	35	279
Total 1977	34	26	31	33	36	33	37	54	40	33	31	48	436
1976	40	19	28	48	45	41	41	43	32	29	48	23	437
1975	39	39	35	41	66	41	48	36	33	42	31	40	491*

*Month of occurrence not known in 6 outbreaks of unknown etiology

FORM APPROVED
OMB NO. 68-R857

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	Quantitative
Example: beef	X		C. perfringens, Hobbs type 10	$2X10^6$/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

1977

F. LINE LISTING OF FOODBORNE DISEASE OUTBREAKS, 1977

Etiology	State	Number of Cases	Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* and Eaten
BACTERIAL								
ARIZONA								
A. hinshawii	Nebraska	13	7-16	+			Unknown	(C) picnic
CLOSTRIDIUM BOTULINUM								
C. botulinum, type E	Alaska	1	2-15	+	+		Salmon eggs	(C) home
C. botulinum, type E	Alaska	2	7-5	+	+		Salmon head & eggs	(C) home
C. botulinum, type E	Alaska	3	10-25	+	+		Seal meat	(C) home
C. botulinum, type E	Alaska	3	10-29	+	+		Seal meat	(C) beach
C. botulinum, type A	Alaska	1	10-30	+	+		Whale meat	(C) home
C. botulinum, type E	Alaska	1	12-1	+			Seal Meat	(C) home
C. botulinum, type A	California	1	5-?	+			Unknown	(D) unknown
C. botulinum, type A	California	1	8-18	+			Unknown	(C) home
C. botulinum, type A	California	1	11-15		+		Home canned vegetables	(C) home
C. botulinum, type A	California	1	12-30		+		Okra	(C) home
C. botulinum, type A	Colorado	1	5-15	+			Unknown	(C) home
C. botulinum, type A	Colorado	1	12-27	+			Unknown	(C) home
C. botulinum, type E	Georgia	1	5-5	+	+		Salmon eggs	(C) home

C. botulinum, type A	Idaho	1	1-28	+	+		Peppers	(C)	home
C. botulinum, type B	Michigan	46	3-31	+	+		Peppers	(B)	restaurant
C. botulinum, type A	Missouri	2	2-5	+	+		Home canned beets	(C)	home
C. botulinum, type unknown	New Jersey	3	1-11				Unknown	(D)	unknown
C. botulinum, type A	Oregon	3	1-28	+	+		Peppers	(C)	home
C. botulinum, type A	Tennessee	1	10-7	+	+		Home canned spaghetti sauce	(C)	home
C. botulinum, type A	Texas	1	9-7	+			Unknown	(C)	home
CLOSTRIDIUM PERFRINGENS									
C. perfringens	Arizona	97	1-11	+	+		Veal	(B)	hotel
C. perfringens	California	27	2-9		+		Unknown	(B)	restaurant
C. perfringens	California	181	9-18		+		Bean burrito	(B)	picnic
C. perfringens	Missouri	44	12-17		+		Turkey & dressing	(B)	fire station
C. perfringens	Pennsylvania	141	11-17	+	+		Turkey & gravy	(B)	school
C. perfringens	Virginia	78	5-19		+		Taco meat filling	(B)	school
SALMONELLA									
S. london	Alabama	7	9-?	+			Beef	(B)	restaurant
S. typhimurium	California	38	4-8	+		+	Chicken	(B)	restaurant

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

Etiology	State	Number of Cases	Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* and Eaten
S. typhimurium	California	15	9-6	+			Ice cream	(C) home
S. typhimurium	Connecticut	200	4-24	+	+	+	Beef & Gravy	(C) private club
S. anatum	Connecticut	6	9-12	+			Chicken	(B) picnic
S. bredeney	Connecticut	9	12-9	+	+		Head cheese	(C) home
S. agona	Florida	2	9-11	+			Unknown	(B) restaurant
S. weltevreden	Hawaii	18	8-28	+		+	Sweet potatoes	(C) home
S. saint-paul	Hawaii	66	9-11	+			Homemade ice cream	(C) home
S. thompson	Iowa	11	8-2	+	+		Homemade ice cream	(C) home
S. typhimurium, S. agona	Iowa	94	8-28	+	+		Beef	(B) restaurant
S. typhimurium	Kansas	100	3-19	+			Beef	(B) restaurant
S. typhimurium	Kentucky	3	1-9	+			Cake icing	(A) home
S. reading	Maine	75	6-25	+		+	Turkey salad	(B) wedding
S. Group D	Maine	4	9-3	+			Frankfurters	(D) home
S. Group B	Massachusetts	18	6-?	+			Turkey salad	(B) wedding reception
S. infantis	Massachusetts	7	8-16	+			Lasagna	(C) home
S. various serotypes	Massachusetts	54	8-?	+	+		Beef	(D) unknown

S. typhimurium	Michigan	37	7–25	+	+		Turkey, baked beans, ribs, ham, greens, turkey & dressing, hot dogs	(C)	home
S. san-diego	Missouri	30	4–?	+			Turkey	(B)	school
S. muenchen S. oranienburg	New Hampshire	13	5–5	+	+		Beef	(B)	restaurant
S. heidelberg	New Jersey	8	2–26	+	+		Chicken	(C)	home
S. chester S. typhimurium	New Jersey	14	5–5	+			Beef	(C)	American Legion Hall
S. typhimurium	New York	6	2–?	+			Unknown	(D)	home
S. newport	New York	24	5–?	+	+		Beef	(D)	unknown
S., species unknown	New York	100	8–10	+			Unknown	(D)	camp
S. infantis	North Carolina	17	5–9	+	+		Pork	(A)	picnic
S. infantis	North Carolina	250	10–16	+	+	+	Barbeque beef/ pork	(B)	restaurant
S. stanley	Oregon	22	4–?	+			Ice cream	(B)	school
S. kottbus	Oregon	40	8–7	+			Turkey	(C)	wedding reception
S. typhimurium	Pennsylvania	2	5–30	+			Beef	(C)	home
S. typhimurium	Pennsylvania	8	8–20	+	+		Beef	(A)	delicatessen
S., species unknown	Pennsylvania	13	9–27	+			Egg salad	(B)	frat house

*(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
S. bareilly S. agona	Tennessee	71	8-4	+			Macaroni & cheese	(B) day care center
S. typhi	Tennessee	26	9-5	+	+		Barbequed pork & dressing	(C) picnic
S. schwarzengrund	Virginia	19	8-19	+	+		Turkey	(B) restaurant
S. typhi	Washington	4	5-8	+			Unknown	(C) outdoor camp
S. heidelberg	Washington	22	6-4	+			Unknown	(B) nursing home
S. typhimurium	New York City	9	8-3		+	+	Roast beef & turkey sandwiches	(B) restaurant
S. enteritidis	Puerto Rico	44	8-17	+			Veal, potato salad	(B) wedding reception
S. anatum S. bovis-morbificans S. chester S. newport S. onderstepoort S. saint-paul S. senftenberg S. typhimurium S. urbana S. virchow S. waycross S. zanzibar	Connecticut New Jersey New York Pennsylvania	200	6-1	+	+		Beef	(A) other
SHIGELLA								
S. sonnei	Arizona	2	6-25	+			Mexican Food	(B) home

S. sonnei	California	12	9–6	+	+	+	Roast chicken, chili con carne, Atole	(C) home
S. flexneri	California	6	12–12	+			Cream puff dessert	(B) airline
S. sonnei	Hawaii	38	8–28	+			Punch, potato salad	(C) school
S. flexneri, 2A	Massachusetts	9	8–30	+			Shrimp, raw clams	(B) roadside vendor
STAPHYLOCOCCUS								
S. aureus	California	4	3–18		+		Custard desserts	(B) home
S. aureus	Connecticut	4	6–10		+		Unknown	(B) delicat-essen
S. aureus, phage 29 enterotoxin A	Georgia	10	1–16	+	+		Ham	(C) home
S. aureus enterotoxin A	Georgia	7	3–23		+		Ham	(B) home
S. aureus, phage 85 enterotoxin A	Georgia	19	5–16	+	+		Chicken & dressing	(C) home
S. aureus, phage 53 enterotoxin A	Georgia	131	6–28	+	+		Chicken & rice	(B) school
S. aureus, enterotoxin A	Georgia	206	8–31		+		Ham	(B) picnic
S. aureus	Idaho	4	8–18		+		Pizza	(B) restaurant
S. aureus	Kentucky	30	8–6		+		Barbequed mutton	(D) festival booth

*(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
S. aureus	Maryland	97	4-21		+		Turkey	(B) school
S. aureus enterotoxin A	Michigan	14	4-24		+		Ham	(B) restaurant
S. aureus	Nevada	5	3-22		+		Shellfish	(B) restaurant
S. aureus enterotoxin A	New Mexico	20	7-31		+		Potato salad	(C) wedding reception
S. aureus	New York	20	10-16		+		Beef	(B) masonic temple
S. aureus, phage 83A/85 enterotoxin A	North Carolina	150	6-30	+	+	+	Chicken salad	(B) school
S. aureus	Ohio	11	10-1		+		Ham	(C) home
S. aureus	Pennsylvania	2	4-20		+		Ham	(B) restaurant
S. aureus	Pennsylvania	18	5-26	+	+		String beans, chocolate cake	(D) fire hall
S. aureus, phage 85	Pennsylvania	5	12-25	+	+		Chicken & dressing	(C) home
S. aureus	South Carolina	9	7-1		+		Ham	(C) American Legion hut
S. aureus enterotoxin B, 96 & 94/96	Tennessee	30	7-17	+	+		Pork	(B) picnic
S. aureus	Washington	4	10-11		+		Ham	(B) restaurant

S. aureus 6/47/53/ 54/75/83A enterotoxin A	Wisconsin	3	1-14	+	+	Hot dog	(B)	restaurant
S. aureus	New York City	2	6-28		+	Ham	(B)	restaurant
S. aureus	Illinois Indiana Kentucky Missouri Ohio	100	7-23	+	+	Whipped butter	(A)	restaurant & home
VIBRIO CHOLERAE								
V. cholerae(not 01)	Guam	2	5-10	+	+	Shellfish	(C)	home
VIBRIO PARAHAEMOLYTICUS								
V. parahaemolyticus	Virgin Islands	98	12-3	+		Fish salad	(B)	cruise ship
V. parahaemolyticus	Guam	20	10-13	+		Shellfish	(B)	labor camp barracks
PARASITIC								
TRICHINELLA SPIRALIS								
T. spiralis	Connecticut	2	3-26		+	Sausage	(C)	home
T. spiralis	Massachusetts	3	11-11	+		Pork	(C)	home
T. spiralis	New Jersey	13	1-1	+		Sausage	(C)	home
T. spiralis	New Jersey	4	1-2	+		Sausage	(C)	home
T. spiralis	New Jersey	7	1-12	+	+	Sausage	(C)	home
T. spiralis	New Jersey	5	1-29	+	+	Sausage	(C)	home
T. spiralis	New Jersey	5	3-1	+		Sausage	(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: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* and Eaten
T. spiralis	New Jersey	5	7-15	+			Sausage	(C) picnic
T. spiralis	New Jersey	3	8-26	+			Pork	(C) home
T. spiralis	New York	28	9-10	+	+		Bear meat	(C) home
T. spiralis	Ohio	2	11-28	+			Sausage	(C) home
T. spiralis	Pennsylvania	2	2-4	+			Pork	(C) home
T. spiralis	Rhode Island	6	11-20	+	+		Sausage	(C) home
T. spiralis	Virginia	2	12-1	+			Pork	(C) home
Anisakidae nematode	California	4	3-22		+		Raw red snapper	(D) home
VIRAL								
Hepatitis A	Nebraska	34	10-?	+		+	Unknown	(B) motel restaurant
Hepatitis A	New York	3	6-16	+		+	Unknown	(B) restaurant
Hepatitis A	Pennsylvania	18	5-10	+			Submarine sandwich	(B) home
Hepatitis A	Washington	17	3-27	+			Shellfish	(B) restaurant
CHEMICAL								
Monosodium Glutamate	Nevada	8	12-2		+		Chinese food	(B) restaurant
Monosodium Glutamate	New York	3	2-4		+		Chinese food	(B) restaurant
Mushroom Poison	California	4	12-?		+		Amanita phalloides	(C) home

Mushroom Poison	Illinois	3	8-27	+	Mycena pura	(C)	home
Mushroom Poison	Michigan	3	8-13	+	Lepiota molyditis	(C)	home
Mushroom Poison	Washington	2	4-27	+	Amanita pantherina	(E)	school
Mushroom Poison	Washington	2	10-16	+	Amanita pantherina	(C)	home
Scombrotoxin	California	2	2-22	+	Mahi-Mahi	(E)	restaurant
Scombrotoxin	California	15	8-30	+	Yellow tail	(B)	restaurant
Scombrotoxin	California	12	9-03		Tuna	(A)	restaurant
Scombrotoxin	California	2	12-20	+	Mahi-Mahi	(B)	restaurant
Scombrotoxin	Connecticut	5	11-3		Bluefish	(B)	cafeteria
Scombrotoxin	Hawaii	1	8-8	+	Mahi-Mahi	(B)	unknown
Scombrotoxin	Hawaii	6	8-10	+	Ahi (yellowfin tuna)	(D)	home
Scombrotoxin	Hawaii	3	8-19		Ahi (yellowfin tuna)	(B)	restaurant
Scombrotoxin	New Jersey	7	8-26	+	Bluefish	(B)	restaurant
Scombrotoxin	New York	12	8-12	+	Tuna fish	(C)	home
Scombrotoxin	Rhode Island	2	10-6	+	Bluefish	(D)	restaurant
Scombrotoxin	Washington	3	8-9	+	Anchovies	(B)	restaurant
Scombrotoxin	Washington	1	8-10	+	Tuna	(A)	home
Ciguatoxin	California	16	6-20	+	Jackfish	(E)	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
Ciguatoxin	Hawaii	4	2-4		+		Amberjack	(E) home
Ciguatoxin	Hawaii	2	10-8				Amberjack	(E) home
Metal, Cadmium	Idaho	69	3-26		+		Punch drink	(B) church
Metal, Cadmium	Idaho	10	4-8		+		Punch drink	(B) wedding party
Metal, Cadmium	Utah	205	2-12		+		Fruit punch	(B) school
Metal, Copper	Vermont	36	3-28		+		Carbonated soft drink	(B) hospital coffee shop
Metal, Copper	New York City	1	5-5		+		Cola	(B) cafeteria
Metal, Copper	New York City	2	6-3		+		Carbonated drinks	(B) restaurant
Metal, Copper/Zinc	New York City	2	10-26		+		Coke	(B) restaurant
Metal, Copper & Iron	New York City	1	11-21		+		Soft drinks	(B) restaurant
Senecio Longilobus	Arizona	1	3-14	+	+		Herbal tea	(A) home
Buck Thorn & Senna	New York	3	10-20		+		Herbal tea	(C) home
Senna	Pennsylvania	3	12-05		+		Herbal tea	(C) home
Trisodium Phosphate	Washington	1	1-11		+		Coffee	(B) restaurant

Trisodium Phosphate	Washington	1	1-21		+	Coffee	(B)	restaurant
Foxglove	Washington	2	5-7	+	+	Herbal tea	(C)	home
UNKNOWN								
	Alabama	63	10-9			Unknown	(B)	picnic
	Arizona	4	5-30			Unknown	(B)	cafeteria
	California	3	1-17			Unknown	(B)	restaurant
	California	4	2-14			Mexican food	(B)	restaurant
	California	12	2-19			Unknown	(B)	restaurant
	California	5	3-9			Unknown	(B)	restaurant
	California	19	3-9			Unknown	(B)	restaurant
	California	33	3-22			Mexican food	(B)	restaurant
	California	11	3-23			Mexican food	(B)	restaurant
	California	4	4-3			Unknown	(C)	home
	California	10	4-15			Mexican food	(B)	restaurant
	California	50	4-15			Macaroni & cheese	(B)	school
	California	13	4-16			Unknown	(B)	restaurant
	California	5	4-18			Unknown	(B)	restaurant
	California	41	5-4			Unknown	(D)	school
	California	26	5-14			Turkey salad	(B)	retirement 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
(UNKNOWN)	California	53	5-21				Unknown	(D) wedding reception
	California	7	6-12				Unknown	(C) home
	California	37	6-29				Beef	(B) restaurant
	California	20	6-30				Chinese food	(D) unknown
	California	65	7-18				Unknown	(D) unknown
	California	4	7-20				Unknown	(C) home
	California	3	9-1				Mexican food	(B) restaurant
	California	138	9-14				Mexican food	(B) school
	California	4	9-16				Unknown	(D) home
	California	7	9-24				Crepes	(B) restaurant
	California	132	9-27				Unknown	(B) restaurant
	California	4	10-9				Unknown	(B) restaurant
	California	55	10-10				Unknown	(B) training camp
	California	13	11-15				Unknown	(B) restaurant
	California	5	11-20				Mexican food	(B) restaurant
	California	6	11-26				Unknown	(B) restaurant
	California	3	11-29				Shellfish	(C) houseboat
	California	4	12-7				Unknown	(B) restaurant

(UNKNOWN)	California	3	12-9			Mexican food	(B)	restaurant
	California	5	12-9			Unknown	(B)	restaurant
	California	6	12-23			Unknown	(C)	office
	California	12	12-24			Unknown	(D)	work
	California	3	12-26			Pizza	(B)	restaurant
	Connecticut	19	1-17			Beef	(B)	dinner theater
	Connecticut	45	4-30			Meatballs, chicken	(B)	dinner theater
	Connecticut	19	6-21			Unknown	(B)	restaurant
	Connecticut	12	9-8			Beef	(B)	restaurant
	Connecticut	25	10-14			American chop suey	(B)	school
	Connecticut	50	12-16			Shellfish	(D)	party
	Connecticut	23	12-17			Shellfish	(B)	hotel ballroom
	Connecticut	12	12-31			Unknown	(C)	home
	Delaware	3	5-?			Shellfish	(D)	picnic
	Florida	449	6-19		+	Chicken salad	(D)	military galley
	Georgia	119	2-9	+		Unknown	(B)	school
	Georgia	3	4-26			Unknown	(D)	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
(UNKNOWN)	Georgia	19	11-20				Turkey & dressing	(C) masonic lodge
	Georgia	44	12-10				Beef	(B) restaurant
	Georgia	2	12-18				Beef	(B) restaurant
	Hawaii	48	11-12				Unknown	(C) state park
	Idaho	38	12-11				Unknown	(B) restaurant
	Iowa	162	3-17				Non-specified salads, sauce	(B) school
	Iowa	38	9-15				Unknown	(B) restaurant
	Kansas	3	7-26				Mexican food	(B) restaurant
	Kansas	51	11-19				Unknown	(B) restaurant
	Kentucky	8	1-19				Unknown	(C) home
	Kentucky	35	7-10				Unknown	(C) lodge
	Kentucky	275	11-17				Unknown	(B) school
	Massachusetts	79	1-22				Unknown	(B) nursing home
	Massachusetts	24	5-14				Unknown	(D) unknown
	Massachusetts	116	10-5				Ham & noodle casserole	(B) mental health facility
	Massachusetts	401	11-4				Unknown	(B) school
	Michigan	5	4-10				Eggs	(C) home

(UNKNOWN)	Michigan	8	10-7	Non-specified salads, sauce	(B)	restaurant
	Minnesota	39	9-14	Unknown	(B)	restaurant
	Minnesota	8	9-23	Beef	(D)	work place
	Minnesota	79	10-2	Unknown	(B)	church
	Mississippi	7	7-9	Unknown	(C)	home
	Missouri	5	2-8	Unknown	(B)	restaurant
	Missouri	21	6-4	Unknown	(B)	restaurant
	Missouri	8	8-28	Unknown	(C)	home
	Missouri	58	12-3	Unknown	(B)	restaurant
	Nebraska	10	7-24	Unknown	(C)	picnic
	New Jersey	54	5-11	Spaghetti & meat sauce	(B)	school
	New Jersey	15	9-29	Unknown	(B)	school
	New Jersey	153	11-2	Collard greens & ham	(B)	state mental institution
	New York	25	1-1	Unknown	(B)	nursing home
	New York	5	1-03	Unknown	(B)	restaurant
	New York	2	1-21	Unknown	(B)	restaurant
	New York	3	1-30	Unknown	(B)	restaurant
	New York	2	2-2	Fish salad	(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: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled* and Eaten
(UNKNOWN)	New York	3	2-4				Unknown	(B) restaurant
	New York	25	2-5				Unknown	(B) unknown
	New York	12	2-12				Chinese food	(B) home
	New York	2	3-2				Chinese food	(B) restaurant
	New York	2	3-27				Unknown	(B) restaurant
	New York	6	4-26				Chinese food	(B) home
	New York	5	5-1				Unknown	(C) home
	New York	4	5-3				Beef	(B) restaurant
	New York	2	5-14				Unknown	(B) home
	New York	37	5-15				Unknown	(B) restaurant
	New York	28	5-26				Tuna	(B) restaurant
	New York	2	6-2				Unknown	(D) unknown
	New York	2	7-18				Unknown	(B) restaurant
	New York	2	7-20				Ice cream	(D) street
	New York	2	7-?				Unknown	(B) restaurant
	New York	6	8-2				Unknown	(D) home
	New York	2	8-25				Unknown	(B) restaurant
	New York	2	8-30				Unknown	(B) restaurant
	New York	19	9-11				Unknown	(D) home

(UNKNOWN)	New York	4	9-16	Unknown	(B)	home
	New York	50	9-18	Unknown	(B)	restaurant
	New York	2	11-1	Unknown	(B)	restaurant
	New York	3	11-5	Unknown	(B)	restaurant
	New York	3	12-11	Sausage & eggs	(C)	home
	New York	100	12-16	Unknown	(B)	senior citizen lunch program
	New York	5	12-17	Unknown	(B)	restaurant
	North Carolina	47	12-14	Beef	(B)	restaurant
	North Dakota	23	7-9	Potato salad	(C)	town hall
	North Dakota	15	9-28	Unknown	(B)	bus
	Ohio	28	3-12	Unknown	(D)	restaurant
	Ohio	5	7-11	Unknown	(C)	home
	Oklahoma	3	2-21	Unknown	(B)	restaurant
	Oklahoma	5	3-7	Unknown	(B)	restaurant
	Oklahoma	8	9-12	Chili hot dog	(B)	restaurant
	Oregon	2	1-6	Unknown	(B)	restaurant
	Oregon	84	1-16	Turkey, potato salad, cheese	(B)	senior citizen hall
	Oregon	29	3-29	Macaroni salad	(B)	restaurant

*(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
(UNKNOWN)	Oregon	69	7-3				Coleslaw	(C) picnic
	Oregon	14	7-18				Unknown	(C) camp
	Oregon	25	8-4				Beef	(B) jail
	Oregon	10	9-4				Mexican food	(B) restaurant
	Oregon	21	12-18				Shrimp salad	(B) restaurant
	Pennsylvania	2	1-31				Pizza	(B) restaurant
	Pennsylvania	21	2-13				Beef stew	(B) school
	Pennsylvania	3	3-21				Green beans	(C) home
	Pennsylvania	3	4-04				Unknown	(D) home
	Pennsylvania	50	4-13				Chicken salad	(C) American Legion hall
	Pennsylvania	2	4-15				Unknown	(C) home
	Pennsylvania	8	4-15				Unknown	(D) unknown
	Pennsylvania	18	7-18				Unknown	(C) home
	Pennsylvania	30	7-20				Unknown	(B) restaurant
	Pennsylvania	2	7-22				Cherry pie	(C) home
	Pennsylvania	3	7-22				Unknown	(C) home
	Pennsylvania	7	8-23				Pizza	(B) delicat-essen
	Pennsylvania	52	8-27				Unknown	(B) restaurant

(UNKNOWN)	Pennsylvania	10	8-30	Unknown	(B)	restaurant
	Pennsylvania	3	8-30	Unknown	(B)	restaurant
	Pennsylvania	3	9-4	Non-dairy beverages	(C)	home
	Pennsylvania	16	10-6	Homemade cake	(C)	office
	Pennsylvania	200	10-14	Unknown	(B)	restaurant
	Rhode Island	47	6-4	Little necks	(B)	restaurant
	Rhode Island	7	10-31	Non-specified salads, sauce	(B)	restaurant
	Rhode Island	9	12-21	Unknown	(B)	hospital
	South Carolina	7	8-6	Unknown	(B)	delicat-essen
	South Carolina	7	9-19	Unknown	(B)	restaurant
	South Carolina	2	11-16	Chinese food	(B)	restaurant
	South Carolina	34	12-10	Macaroni salad	(B)	military armory
	Tennessee	21	3-18	Liver & onions	(B)	unknown
	Tennessee	62	5-9	Coleslaw & potato salad	(B)	golf & country club
	Tennessee	26	12-9	Dressing & gravy	(B)	cafeteria
	Texas	10	1-3	Unknown	(B)	restaurant
	Virginia	3	4-22	Mexican food	(B)	restaurant

*(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
(UNKNOWN)	Virginia	5	6-19				Corned beef, Kool-Aid	(C) home
	Virginia	2	9-16				Unknown	(B) restaurant
	Virginia	26	10-23				Scalloped potatoes	(B) VFW hall
	Virginia	6	11-2				Unknown	(C) home
	Virginia	54	12-05				Beef	(B) restaurant
	Washington	2	1-8				Chinese food	(B) restaurant
	Washington	3	2-6				Chinese food	(B) restaurant
	Washington	6	2-24				Shellfish	(D) restaurant
	Washington	4	3-24				Unknown	(B) restaurant
	Washington	2	4-1				Beef	(B) restaurant
	Washington	3	4-8				Turkey	(B) restaurant
	Washington	2	5-3				Beef	(C) home
	Washington	5	5-14				Greek food	(B) restaurant
	Washington	2	5-17				Chinese food	(B) restaurant
	Washington	2	5-18				Mexican food	(B) restaurant
	Washington	2	5-22				Chinese food	(B) restaurant
	Washington	3	6-14				Chinese food	(B) restaurant
	Washington	2	6-19				Pork	(B) restaurant

(UNKNOWN)	Washington	5	6-20	Chinese food	(B)	restaurant
	Washington	2	6-24	Mexican food	(B)	restaurant
	Washington	4	6-27	Hawaiian food	(B)	restaurant
	Washington	4	7-1	Beef, salami	(B)	restaurant
	Washington	3	7-17	Mashed potatoes	(B)	restaurant
	Washington	3	8-8	Chinese food	(B)	restaurant
	Washington	2	8-14	Chinese food	(B)	restaurant
	Washington	2	8-15	Turkey	(B)	restaurant
	Wahington	2	8-28	Beef	(B)	restaurant
	Washington	2	8-29	Root beer	(B)	restaurant
	Washington	4	9-2	Beef	(B)	restaurant
	Washington	2	9-9	Chinese food	(B)	restaurant
	Washington	2	9-19	Chinese food	(B)	restaurant
	Washington	320	10-7	Unknown	(C)	school
	Washington	2	11-1	Beef & bean burrito	(B)	lunchroom at work
	Washington	3	11-5	Shellfish	(B)	restaurant
	Washington	3	11-13	Mexican food	(B)	restaurant
	Washington	4	11-27	Chinese food	(B)	restaurant
	Washington	2	11-30	Cake icing	(B)	home
	Washington	2	12-9	Chinese food	(B)	restaurant

*(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
(UNKNOWN)	Washington	3	12-17				Cheese cake	(D) restaurant
	Guam	12	7-17				Unknown	(B) hospital
	Guam	6	8-19				Unknown	(C) social services division
	Guam	5	9-3				Shellfish	(B) work place
	Guam	9	11-24				Unknown	(D) unknown
	Guam	9	12-17				Unknown	(B) picnic
	New York City	3	1-2				Unknown	(B) restaurant
	New York City	4	1-2				Chinese food	(B) restaurant
	New York City	4	1-7				Ice cream	(B) home
	New York City	3	1-10				Unknown	(B) restaurant
	New York City	5	1-17				Chinese food	(B) restaurant
	New York City	2	1-21				Chinese food	(D) home
	New York City	3	1-23				Unknown	(B) picnic
	New York City	9	1-25				Unknown	(B) restaurant
	New York City	2	2-12				Unknown	(B) restaurant
	New York City	5	2-12				Unknown	(B) restaurant
	New York City	5	2-21				Unknown	(B) restaurant
	New York City	6	2-22				Chinese food	(B) restaurant

(UNKNOWN)	New York City	2	3-2	Unknown	(B)	restaurant
	New York City	2	3-3	Chinese food	(B)	restaurant
	New York City	3	3-6	Chinese food	(B)	restaurant
	New York City	4	3-9	Unknown	(B)	restaurant
	New York City	2	3-12	Corned beef sandwich	(B)	restaurant
	New York City	2	3-27	Unknown	(B)	restaurant
	New York City	2	4-4	Unknown	(B)	restaurant
	New York City	3	4-8	Chinese food	(B)	restaurant
	New York City	5	4-16	Unknown	(B)	office
	New York City	2	4-17	Unknown	(B)	restaurant
	New York City	3	4-17	Unknown	(B)	restaurant
	New York City	2	4-21	Chinese food	(B)	restaurant
	New York City	5	4-22	Unknown	(B)	restaurant
	New York City	5	4-30	Pizza	(B)	home
	New York City	3	5-2	Unknown	(B)	restaurant
	New York City	4	5-19	Unknown	(B)	restaurant
	New York City	6	6-9	Chinese food	(B)	restaurant
	New York City	4	6-10	Unknown	(B)	restaurant
	New York City	3	6-16	Chef salad	(B)	restaurant
	New York City	3	6-21	Macaroni salad	(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
(UNKNOWN)	New York City	2	6-22				Chinese food	(D) home
	New York City	5	6-23				Unknown	(B) restaurant
	New York City	2	6-26				Unknown	(C) home
	New York City	2	7-1				Unknown	(B) restaurant
	New York City	2	7-4				Unknown	(B) restaurant
	New York City	5	7-7				Unknown	(D) home
	New York City	2	7-8				Unknown	(B) restaurant
	New York City	2	7-15				Unknown	(B) restaurant
	New York City	3	7-19				Pizza	(B) restaurant
	New York City	40	7-27				Unknown	(B) senior citizen center
	New York City	4	7-29				Bluefish	(B) restaurant
	New York City	4	7-?				Unknown	(B) restaurant
	New York City	2	8-1				Unknown	(B) restaurant
	New York City	2	8-2				Unknown	(B) restaurant
	New York City	3	8-5				Unknown	(D) street
	New York City	3	8-14				Chinese food	(B) restaurant
	New York City	5	8-19				Unknown	(B) restaurant
	New York City	3	8-20				Unknown	(B) restaurant

(UNKNOWN)	New York City	3	8-21	Unknown	(B)	home
	New York City	2	8-?	Tuna salad sandwich on rye	(B)	restaurant
	New York City	2	8-?	Unknown	(B)	restaurant
	New York City	2	9-5	Ham	(B)	home
	New York City	2	9-13	Unknown	(B)	restaurant
	New York City	2	9-16	Unknown	(B)	restaurant
	New York City	2	9-27	Unknown	(B)	restaurant
	New York City	2	10-4	Chinese food	(D)	home
	New York City	2	10-9	Unknown	(B)	restaurant
	New York City	2	10-23	Unknown	(B)	restaurant
	New York City	2	10-28	Unknown	(B)	restaurant
	New York City	8	10-30	Unknown	(B)	home
	New York City	2	11-01	Unknown	(B)	restaurant
	New York City	2	11-2	Unknown	(B)	restaurant
	New York City	3	11-12	Unknown	(B)	restaurant
	New York City	2	11-13	Unknown	(B)	restaurant
	New York City	2	12-1	Unknown	(B)	restaurant
	New York City	2	12-6	Unknown	(B)	restaurant
	New York City	2	12-8	Unknown	(B)	restaurant

*(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	40	12–12				Unknown	(B) restaurant
	New York City	2	12–16				Unknown	(B) restaurant
	New York City	4	12–18				Unknown	(B) restaurant
	New York City	3	12–20				Unknown	(B) restaurant
	New York City	6	12–20				Chinese food	(B) restaurant
	New York City	2	12–24				Unknown	(B) restaurant
	New York City	4	12–29				Veal	(B) restaurant
	Puerto Rico	55	10–11				Unknown	(B) camp

G. Guidelines for Confirmation of Foodborne Disease Outbreak

	Clinical Syndrome	Laboratory and/or Epidemiologic Criteria
BACTERIAL		
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 ≥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, 1977, Taken from Morbidity and Mortality Weekly Report

Botulism - Michigan
(MMWR 26(14):117, 1977)

The largest outbreak of botulism reported in the United States was under investigation by local, state, and federal health officials in Michigan.

On March 31, 1977, the Michigan State Department of Public Health learned that 2 employees of a hospital in Pontiac, Michigan, had been admitted to the hospital with signs and symptoms compatible with botulism. Both individuals had in common a food exposure at a Mexican restaurant located near the hospital in Pontiac. By the next morning, 12 additional probable cases had been identified. All 14 patients had eaten at the implicated restaurant on March 28 or 29. The only food item eaten by all of the patients was a hot sauce prepared with red tomato sauce and home-canned green jalapeno peppers.

The restaurant usually used fresh peppers and had only begun to use home-canned peppers on March 28. A sample of the home-canned peppers and stools from ill persons were found to contain type B botulinal toxin. By April 5, 39 persons with neurological signs compatible with botulism were identified among the several hundred persons who had eaten at the restaurant. No deaths had occurred. Most of the patients were residents of Michigan, but 1 was a visitor from Ohio who became ill after leaving Michigan.

All patients with clinical findings consistent with botulism were treated with trivalent (ABE) antitoxin. County officials closed the restaurant on March 31.

Editorial Note: The largest previous outbreak of botulism occurred in 1921 in Michigan and affected 29 persons, 3 of whom died. That outbreak of type A botulism was caused by commercially canned spinach.

Follow-up on Botulism - Michigan
(MMWR 26(16):135, 1977)

Forty-six cases of type B botulism were diagnosed in Michigan in the period March 31 - April 6, 1977, in persons who ate at a Mexican restaurant located in Pontiac, Michigan, from March 28 to March 31 (MMWR 26(14), 1977). All ill persons had neurologic symptoms and signs except 1. This individual had symptoms without objective neurologic abnormalities, but his stool had type B botulinal toxin identified by the Anaerobic Section at CDC. Forty-four patients were hospitalized. Thirty-three persons who were skin-test negative to trivalent (ABE) botulinal antitoxin of equine origin were treated with antitoxin. There were 2 immediate adverse, but mild reactions - watery eyes in 1 case and an erythematous non-urticarial rash in the other - which resolved when treated with an antihistamine. Eight persons were admitted to an intensive care unit at some time during their course, and 3 required intubation and respiratory assistance. There were no deaths.

All of the patients had consumed a hot sauce either by adding it to their food or by eating a nacho which contained the sauce. When the food histories of patients and asymptomatic hospital employees who ate at the restaurant during the outbreak period were compared, illness was found to be significantly associated with consumption of hot sauce ($p=.0002$). Type B botulinal toxin has been identified in the stools of 4 clinically confirmed cases and also in 1 jar of the home-canned jalapeno peppers used in the preparation of hot sauce.

Editorial Note: This is the second outbreak of botulism in the United States in 1977 caused by improperly home-canned jalapeno peppers. In this instance the peppers were home-canned in October 1976 because a shortage of these peppers was expected for the winter of 1976-77. It is not known whether this shortage was a factor in the previous outbreak.

In Michigan, as in most states, serving home-canned foods in a commercial establishment is a violation of state health regulations. If other commercial establishments attempt to avoid product shortages or rising prices by home-canning, more botulism cases may occur.

Type A Botulism Associated with Commercial Pot Pie - California
(MMWR 26(23):186, 1977)

A 13-year-old boy was taken to a Long Beach community hospital emergency room with acute onset of dizziness, generalized weakness, diplopia, dysphagia, and dysphonia on December 21, 1976. Physical signs included ptosis, ophthalmoplegia, facial paralysis, decreased gag reflex, generalized muscle weakness, and hypoactive deep tendon reflexes. He had no fever or sensory deficits. Vital capacity was only 150 cc, and he was intubated. CSF was normal, and edrophonium testing was negative. Since botulism was suspected, stool and serum specimens were submitted to the state's Microbial Diseases Laboratory. Epidemiologic history implicated a frozen commercial meat pie eaten 49 hours before the onset of the patient's symptoms.

The patient's family had eaten pot pies, either chicken or beef, as the main course for dinner on December 16. The pies, 5 to 6 inches in diameter, had been purchased a week earlier from a local market and kept frozen until baked December 16 for 1 hour at 425 F and then eaten without incident. The next afternoon, one of the patient's sisters took another meat pie from the freezer and placed it in the oven at 425 F. After 20 minutes, she decided to eat something else; she turned off the oven, but left the pie inside. The pie remained there until the next day, when at about 1 PM, the patient decided to have a pot pie for lunch and ate the one in the oven. (The pie had been there 20 hours). After 2 or 3 bites, the patient complained that it "did not taste right". His father smelled the pie, agreed that it had an "off" smell and suggested throwing it out. When the boy took the pie from the oven, it was warm, not hot, and he held it in his hands without discomfort; no vapor arose from the pie when the cruse was broken. The family has a gas oven with both pilot lights in working order.

The patient received 3 units of bivalent (AB) botulinal antitoxin as well as guanidine. He was hospitalized for 8 weeks; he had a tracheostomy for nearly all of that time. However, he has now made a nearly complete recovery. Type A botulinal toxin was identified in the patient's pretreatment serum, his stool, and in the suspect meat pie recovered from the garbage can. _Clostridium botulinum_ type A was recovered from the beef pie, but no organisms were isolated from the patient's stool. Another beef pie of the same brand was cultured; _C. botulinum_ was not isolated.

Editorial Note: This is the third episode since 1960 of botulism associated with commercial pot pies (1,2). In at least 2 episodes, the pies from different manufacturers were mishandled, that is, maintained at "incubator" temperatures overnight in ovens with pilot lights. Frozen pot pies should be heated as per package instructions and then consumed shortly thereafter. If not eaten after heating, they should be refrigerated and thoroughly reheated before consumption, so that the internal temperature of the pie (that is, the center portion) is sufficiently high to inactivate botulinal toxin, if present. Ordinarily, even high levels of toxin in foods are inactivated if an internal temperature of 100 C (212 F) is maintained for a few minutes.

References
1. MMWR 9(27):2-8, 1960
2. California Morbidity No. 46, November 21, 1975

Salmonellosis - Kentucky
(MMWR 26(29):239, 1977)

Three cases of multiple-drug resistant Salmonella infection apparently acquired from consumption of unpasteurized milk occurred in a 4-member family in Kentucky in January.

The index cases were 2 children who developed fever, chills, diarrhea, and abdominal cramps on January 9, 1977. When they were hospitalized 2 days later, stool specimens from each child were positive for Salmonella typhimurium. On January 29, the father developed a similar illness, and a stool specimen yielded S. typhimurium. The mother was not ill, and a stool specimen she submitted on February 22 was negative for Salmonella organisms.

Investigation revealed that the father had worked on a dairy farm during December and January. On January 7, he had brought home raw milk from the farm; it was used for baking and as an ingredient in cake frosting. The cake was eaten that day by the 2 children, their father, and 2 family friends. The mother, who ate no frosting, and the 2 friends did not become ill. The remaining cake and frosting were discarded January 18. The children had no contact with anyone with gastrointestinal illness in the days before onset of illness, and no other suspect source of Salmonella organisms was identified.

The dairy farm where the father worked is a grade A operation with about 70 cows. The farm is owned by 2 brothers who, along with their mother, wives, and children - a total of 11 people - regularly drink raw milk produced there. There were no other employees, and no other persons used raw milk from the herd. Of these 11 family members, only one, an owner, had a recent gastrointestinal illness. He had had a 3-day illness during the week of January 17 that included abdominal pains, vomiting, diarrhea, and chills. He did not seek medical attention and took no antibiotics. A stool specimen obtained February 16 was negative for Salmonella organisms.

At the farm, calves are separated from the adult cows shortly after birth, kept in a calf barn, and allowed no direct contact with adult cows. From October 1976 to January 1977, there were at least 5 cases of diarrhea among the dairy cows; there were no cases of diarrhea or unusual morbidity or mortality among the calves. Two of the ill cows survived, one died, and the other 2 were shipped to slaughter. On February 16, fecal specimens were obtained from 8 cows, including the 2 that had survived the diarrheal illness, and 2 calves. There was no gastrointestinal illness in the herd at that time. Two fecal specimens were positive for S. typhimurium; one was from one of the previously symptomatic cows, the other from an apparently healthy calf. All Salmonella isolates from animals and humans had the same phage lysis pattern (1156121112A) and antibiogram, including resistances to streptomycin, tetracycline, amphicillin, carbenicillin, and penicillin. Four of the 5 isolates tested were also resistant to kanamycin.

Editorial Note: This investigation demonstrates that multiply-resistant Salmonella organisms may be transmitted from animals to man, emphasizing that increased antibiotic resistance of Salmonella organisms in animals poses a risk to humans. In this outbreak transmission in the children may have occurred through the ingestion of frosting made with contaminated raw milk. The father's long incubation period suggests that he may have acquired the disease from the children or from his continued exposure to the farm animals. Unpasteurized dairy products may carry microbial pathogens which may cause salmonellosis, brucellosis, tuberculosis, Q fever, typhoid fever, shigellosis, and streptococcal disease. When pasteurized, milk is rarely linked to such diseases. In countries where milk is not routinely pasteurized, milk-borne transmission of these illnesses remains a significant problem.

Multi-state Outbreak of *Salmonella newport* Transmitted by Precooked Roasts of Beef (MMWR 26(34):277, 1977)

An outbreak of salmonellosis in New York, New Jersey, Connecticut, and Pennsylvania during June, July, and August 1977 has been epidemiologically and bacteriologically traced to precooked, ready-to-eat beef served in delicatessens and sold in supermarkets.

The problem was first recognized when 2 outbreaks occurred in 2 upstate New York counties (Erie and Cortland) in late June and early July 1977. In both outbreaks *Salmonella newport* (serogroup C_2) was isolated from persons who had eaten precooked roast beef served in delicatessens. Clinical findings in affected cases consisted of diarrhea, cramps, chills, and fever. In the Erie County outbreak, *S. newport* was isolated from the roast beef and from at least 4 patients. In both outbreaks the precooked roasts of beef were from the same source, a meat-processing company in Philadelphia. The U.S. Department of Agriculture (USDA) conducted an investigation of the plant, collecting environmental specimens and whole roasts of beef. Two *Salmonella* serogroups, E_1 and C_1, were obtained from the environment, and 2 *Salmonella* serogroups, B and C_2, were obtained from both the internal and external surfaces of 4 individual roasts of beef. The USDA and the company have initiated a recall of all such products distributed up to July 28.

A review of national surveillance data demonstrated 345 *S. newport* isolates in June and July 1977, compared with 222 in the same period in 1976. In this same 2-month period Connecticut, New Jersey, New York, and Pennsylvania experienced marked increases in *S. newport*.

Based on these data, a collaborative study was initiated by the 4 state health departments and CDC. This study has revealed that from June 1 to August 19, 140 *S. newport* cases have been reported by the 4 state health departments. Of the 63 cases interviewed, 32 gave a history of precooked roast beef consumption.

Additional information is available from investigations in New Jersey, Connecticut, and New York. In New Jersey since June 1, 49 cases of *S. newport* infection have been reported. Ten of 23 interviewed patients consumed precooked roast beef, which had been produced by at least 6 different companies, including the Philadelphia one. The New Jersey State Department of Health obtained unopened roasts from 5 producers and has cultured *S. newport* and *S. waycross* from beef from 1 Jersey City producer. A case-control study conducted by the New Jersey State Department of Health comparing precooked roast beef consumption among cases of *S. newport* salmonellosis and among age-matched cases with other *Salmonella* serotypes demonstrated a statistically significant association with the consumption of roast beef ($p=.012$).

In Connecticut 14 of the 38 cases of *S. newport* infection that have occurred since June 1 have been interviewed by the state health department. Nine have a history of eating precooked roast beef. These cases involve 3 different producers, including the Philadelphia company. Specimens of roast beef are being collected for bacteriologic examination.

In New York 42 *Salmonella* serogroup C_2 isolates have been reported since June 1. Of 36 investigated cases 19 had consumed precooked roast beef. A case-control study using hepatitis patients of similar ages demonstrated that salmonellosis was statistically associated with roast beef consumption ($p=.0005$).

Further investigations are in progress in Pennsylvania.

Editorial Note: This is the third consecutive year in which precooked roasts of beef have been associated with multistate outbreaks of salmonellosis (1,2). This recurrent problem with precooked roasts of beef from different producers emphasizes that this is a continuing problem with significant public health implications.

This is not the first time that salmonellae have been identified in unopened roasts. However, in the 1975 outbreak of *S. saint paul* (1) the beef had been injected with a spice mix in preparation for cooking. In the present situation, no such procedures were used, yet salmonellae were isolated from both external and internal surfaces of the roasts. Whatever the mechanism of such contamination, precooked roasts may continue to pose a risk as long as they are cooked to internal temperatures of less than 130 F. Such temperatures are used for precooked roast beef but are not high enough to destroy salmonellae.

References
1. MMWR 25:34, 1976
2. MMWR 25:333, 1976

Staphylococcal Food Poisoning - Wisconsin
(MMWR 26(28):226, 1977)

Three cases of staphylococcal foodborne illness apparently due to ingestion of restaurant-prepared hot dogs occurred in January in Wisconsin.

The index patient, a 26-year-old woman, was admitted to a Milwaukee hospital on January 14 with symptoms including cramps, vomiting, diarrhea, and general weakness. The patient had become ill 3 hours after eating a hot dog sandwich at a local fast-food restaurant. Because of pre-existing diabetes, the patient's gastrointestinal illness was treated for 2 days in the hospital intensive care unit. The patient's husband, who had eaten a hamburger at the same meal, did not become ill.

The restaurant manager acknowledged receiving another complaint the same day concerning 2 children who became ill after eating hot dog sandwiches. One child, a 2½-year-old girl, had had onset of vomiting, diarrhea, and malaise 3 hours after eating half of a hot dog and had been treated for gastrointestinal illness in the outpatient unit of a Milwaukee hospital. Her cousin, who had eaten 2 bites of a hot dog at the same time, had onset of vomiting 3½ hours after the meal.

Coagulase-positive staphylococci of phage type 6/47/53/54/75/83A were isolated from a rectal swab and 2 emesis specimens collected from the index patient at the time of her admission. A hot dog obtained by the index patient's family from the serving line of the restaurant the evening of January 14 was found to contain 500,000 coagulase-positive staphylococci per gram of the same phage type. On January 15, cultures of frankfurters from an opened, partially used box of refrigerated frankfurters yielded 44,000 coagulase-positive staphylococci of the same phage type.

The restaurant's practice had been to store frankfurters in a refrigerated wire basket. Employees had adopted the practice of transferring frankfurters from the refrigerator to a warming tray where they were held at 120 F - 140 F for extended periods. When orders were received, the frankfurters were removed from the warming tray and steamed at a "high temperature" before serving.

Isolates of coagulase-positive staphylococci from the clinical specimens, from the serving line hot dog, and from previously handled, refrigerated frankfurters were all found to produce enterotoxin type A. Staphylococcal enterotoxin was not detectable in frankfurters taken from the previously unopened refrigerated supply, however.

Editorial Note: Although frankfurters have an impressive record of safety (1), this outbreak emphasizes that they can cause disease when mishandled. In one study of 40 firms, occasional *Staphylococcus aureus* contamination was found in packaged frankfurters (2). In this outbreak, retention of frankfurters in a warming tray for extended periods presumably permitted replication of enterotoxin-producing staphylococci. Because the box of refrigerated frankfurters had been opened and its contents handled by restaurant personnel, the source of contamination could not be determined. This outbreak further emphasizes the need for refrigeration of this product prior to cooking, as temperatures commonly used in cooking do not inactivate the *S. aureus* enterotoxin (3).

References
1. MMWR 25:229-230, 1975

2. Surkiewicz BF, Johnston RW, Carosella JM: Bacteriological survey of frankfurters produced at establishments under federal inspection. J Milk Food Technol 39:7-9, 1976
3. Merson MH, Hughes JM, Gangarosa EJ: Miscellaneous food poisoning in Practice of Medicine, Hagerstown, Maryland, Harper & Row, 1976

Presumed Staphylococcal Food Poisoning Associated with Whipped Butter
(MMWR 26(32):268, 1977)

Whipped butter produced by a single manufacturing plant in Kentucky was implicated in a multi-state outbreak of food poisoning that began the last week of July. The illness was characterized by nausea, vomiting, abdominal cramps, diarrhea, and prostration within 4-6 hours of ingestion - symptoms compatible with staphylococcal food poisoning.

Over 100 cases, including several persons that required hospitalization, were reported to state officials in Illinois, Indiana, Kentucky, Ohio, and Missouri. Most of these cases were associated with restaurants that had received shipments of 16-pound containers of butter produced by the Sugar Creek Division of Beatrice Foods Company on June 28 and June 30. The company also produces consumer-size packages, distributed under a number of different brand names in at least 18 states; in Indiana, Ohio, and West Virginia, 4 small outbreaks have been associated with packages of this size. The other 15 states to which the consumer-size packages were distributed are: Arkansas, Florida, Georgia, Illinois, Kentucky, Louisiana, Michigan, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, Tennessee, Texas, and Virginia. The following labels are involved: Sugar Creek, Prairie Farm, A&P, Armour, Chappel, Mayflower, Blue Valley, Meadowgold, Lucerne, Coleman, and Kountry Fresh.

On August 4 the manufacturer closed the plant, and the following day voluntarily recalled all whipped butter produced by the plant from June 21 through August 4. On August 9 the manufacturer voluntarily recalled all remaining whipped butter produced before June 21. The recalled butter bears lot numbers coded with the first 3 numbers of 216 or below (on the 16-pound containers) or the "pull date" of September 12, 1977, or before (on the consumer-size packages). *Staphylococcus aureus* organisms in counts up to 10^7/gm have been isolated from lots of whipped butter produced between June 28 and August 3. A sample of the butter produced on June 21 showed no growth of the organisms. Enterotoxin studies are pending.

The plant remains closed, and investigations are continuing to determine the source of contamination.

Editorial Note: The magnitude of this outbreak is difficult to ascertain because some of the contaminated whipped butter was distributed in consumer-size packages. Illness in persons who ate whipped butter from such packages would appear as isolated incidents that would not be as likely to be reported as restaurant-associated outbreaks.

Staphylococcal contamination of butter is rare because the high lipid concentration in butter is not conducive to growth of the organism. Previous staphylococcal outbreaks attributed to butter have usually involved products to which higher protein foods, such as milk, had been added (1).

Reference
1. MMWR 19:271, 1970

Foodborne Outbreak of Hepatitis A - Pennsylvania
(MMWR 26(30):247, 1977)

Eighteen cases of hepatitis A occurred in the 1-month period from May 10 to June 10, 1977, among approximately 580 persons who purchased sandwiches at a local softball team benefit in eastern Pennsylvania.

The average age of cases was 25.4 years. There were 5 females and 13 males. Ten of the 18 cases were hospitalized.

The outbreak was first suspected when a county which usually reports 2 to 6 cases of hepatitis A a year reported 9 cases in a 2-week period in May. Because each of the cases had onset of illness within a 16-day period, a common-source outbreak was suspected. Foodborne transmission was postulated because preliminary questioning of the patients revealed that each had eaten a submarine sandwich prepared and sold by the team on April 23. Furthermore, 1 of the team members had developed hepatitis A on April 30.

Subsequent case-finding techniques - including letters to physicians in the area, inspection of hospital discharge diagnoses and emergency room records, and review of laboratory logs for HBsAg test specimens - revealed a total of 23 cases of hepatitis A in persons with onset from May 10-June 10. Eighteen of these (78%) had eaten a suspect sandwich on April 23.

Subsequent surveys confirmed the association. A telephone questionnaire, which compared cases both with neighborhood controls matched for age and sex as well as with well household contacts, significantly associated illness with ingestion of submarine sandwiches (p=.0000003* and p=.0002,* respectively). The member of the organization who developed disease 8 days after the benefit had helped fill the sandwiches with bologna, salami, ham, cheese, lettuce, onions, and tomatoes. Using April 23, the day that the sandwiches were sold, as the date of exposure, the mean incubation period for the 18 cases was 32 days, with a range from 21 to 45 days.

Thirty-two of 54 household contacts (59%) received injections of immunoglobulin (IG). The only secondary case of hepatitis A among family members of the cases occurred in an 11-year-old girl who had not received IG. Since the population at risk was 6 weeks past exposure to the hepatitis virus when the outbreak was recognized, mass prophylaxis with IG of all persons who ingested the sandwiches was not recommended.

*Fisher's exact test

Editorial Note: Peak fecal excretion of hepatitis A virus (HAV), and therefore peak infectiousness, occur prior to the onset of symptoms (1,2). Since a foodhandler would typically be asymptomatic when most infectious, routine good hygiene and sanitary food preparation cannot be overemphasized as the most important means of prevention of HAV transmission.

Immunoprophylaxis following exposure to HAV is most effective when the IG is administered within 1 to 2 weeks after exposure. In practice, however, once enough cases are recognized to document a common-source exposure, IG administration is usually too late to benefit any of the remaining exposed individuals (3). Therefore, mass IG immunoprophylaxis in documented common-source HAV outbreaks is not routinely recommended.

References

1. Dienstag JL, Feinstone SM, Kapikian AZ, et al: Fecal shredding of hepatitis A antigen. Lancet 1:765-767, 1975

2. Rakein J, Mosley JW: Fecal excretion of hepatitis A virus in humans. J Infect Dis 135:933-938, 1977

3. Denes AE, Smith JL, Hindman SH, et al: Foodborne hepatitis A infections: A report of two urban restaurant-associated outbreaks. Am J Epidemiol 105:156-162, 1977

Poisoning Associated with Herbal Teas - Arizona, Washington
(MMWR 26(32):257, 1977)

Four cases of poisoning associated with consumption of "herbal teas" mistakenly made with poisonous substances were reported to CDC in August 1977. Three cases were fatal.

Two of the cases were in Arizona infants who had been fed large quantities of a tea prepared from a locally marketed product called gordolobo yerba, which is usually made from leaves of plants of the Gnaphalium species. This tea is widely used as a gargle and cough medicine by the Hispanic population to which the children belonged. Analysis of the tea fed to the children revealed, however, that it had inadvertently been made from Senecio longilobus, an hepatotoxic herb containing pyrrolizidine alkaloids. These are the first domestic cases of pyrrolizidine-induced disease in humans reported in the United States (1).

The Washington cases - both fatal - were in an elderly couple who drank a home-prepared tea in which foxglove had been used instead of comfrey. Details of all 4 cases follow.

Arizona

Patient 1: A 6-month-old well-nourished Hispanic girl was admitted in early July 1976 to the Tucson Medical Center with a 1-day history of emesis and irritability. She had been seen by her pediatrician 2 weeks before for symptoms of a mild respiratory infection; physical examination at that time was normal. Admission physical examination revealed an irritable infant with a distended abdomen and a prominent abdominal venous pattern; her liver span was 9 cm, and her spleen was easily palpable. An initial SGOT was 974 IU/1 and bilirubin 0.5 mg%; her prothrombin time, originally 12.8 seconds, was 16.4 seconds 4 days later. Radiologic examination indicated a right pleural effusion and ascites. The ascitic fluid was clear, yellow, and contained 1.3 gm% protein and 5 lymphocytes/mm^3. A needle liver biopsy revealed normal hepatic architecture and intact hepatocytes. However, the sinusoids were markedly distended with mature erythrocytes. An echocardiogram and arteriograms of the inferior vena cava and hepatic vein were normal.

In an initial interview the girl's parents stated that the patient had been fed large quantities of tea, prepared from a locally marketed herb, known as gordolobo yerba. However, laboratory analysis revealed that the patient's tea was made from the herb Senecio longilobus. An extract from a specimen revealed large quantities of toxin pyrrolizidine alkaloids.

A liver biopsy obtained 2 months after the initial biopsy revealed extensive central, portal, and sinusoidal fibrosis. A third liver biopsy, obtained 8 months after admission, revealed cirrhosis. The patient still had ascites, requiring a low sodium diet and diruetics for control. Her SGOT was slightly elevated, but her other liver function tests, growth, and development were normal.

Patient 2: A 2-month-old Hispanic boy was admitted to a Phoenix hospital on March 15, 1977, with a 1-day history of lethargy, emesis, and hematemesis. On physical examination, the patient was icteric with hepatomegaly; he subsequently developed both splenomegaly and ascites. Initial SGOT was 10,640 IU/1, bilirubin 10.0 mg%, and prothrombin time 96 seconds; blood glucose, as measured with a Dextrostix*, indicated profound hypoglycemia. Despite vigorous therapy, including 2 exchange transfusions, the patient died 6 days following admission. Postmortem examination of the liver revealed sinusoidal and central vein congestion with necrosis of hepatocytes most marked in central areas.

For 5 days prior to admission the patient had been fed an herbal tea as a cough medicine. Purchased at a local pharmacy, it also was made from Senecio longilobus; analysis of the herb revealed large quantities of toxic pyrrolizidine alkaloids.

*Use of trade names is for identification only and does not constitute endorsement by the Public Health Service, U.S. Department of Health, Education, and Welfare.

Washington

An elderly Chehalis couple attended a health spa that recommended comfrey tea as an herbal remedy for their arthritis. The couple had experimented with various herbal teas, but the woman's knowledge of plants was limited.

On Saturday, May 7, 1977, she picked what she believed to be comfrey plants and made herbal tea, which she and her husband drank with their lunch. One hour later, they became incapacitated with nausea, vomiting, dizziness, and sweating. Later in the afternoon, the husband discovered some foxglove plants in the refrigerator. Realizing that this herb - the leaves of which are similar to comfrey - had mistakenly been substituted for comfrey in their tea, he immediately called an ambulance. When the ambulance arrived at 4:30 p.m., his wife already was dead. The husband arrived at a local hospital at 5:00 p.m. suffering from abdominal cramps and vomiting. An electrocardiogram revealed a supraventricular rate of 60 with occasional premature atrial contractions and a ventricular rate of 30. A subsequent rhythm strip showed a fine arterial flutter with a ventricular rate of 30, followed by an episode of ventricular tachycardia.

The patient was treated with antiarrhythmic drugs, and a pacemaker was inserted into his coronary sinus. He received gastric lavage and was treated with charcoal. His serum potassium was 5.3 meq/l. He was transferred to a university hospital in Seattle, where physical examination, except for a short late systolic murmur, was normal. An electrocardiogram revealed a pacemaker-induced rate of 80. Serum electrolytes and complete blood count were normal. The patient's condition was stable for the first 17 hours after his admission. Then he arose to vomit and developed an episode of ventricular tachycardia which progressed to refractory ventricular fibrillation. Cardiopulmonary resuscitation was unsuccessful, and he died the evening of May 9. The digitoxin level in his serum was found to be >80 ng/ml. (Therapeutic levels usually range between 5-30 ng/ml.) Aside from mild hypertension treated with Dyazide,* the man's medical history revealed no previous heart problems. A past medical history for his wife was not available.

Editorial Note: The pyrrolizidine alkaloids are hepatotoxic and are found in a wide variety of plants (2). One of these is Senecio longilobus (sometimes referred to as thread leave groundsel), native to the deserts of the southwestern United States and northern Mexico.

Veterinarians and farmers have long recognized that ingestion by livestock of plants containing pyrrolizidine alkaloids can cause acute and chronic damage to the liver and lungs of animals and may lead to death (2). The chronic effects of prolonged ingestion of small amounts by humans is unknown. Human hepatic veno-occlusive disease has occurred after ingestion of large amounts of contaminated grain products or "bush teas". Recent outbreaks of pyrrolizidine poisoning have been recorded in Afghanistan and India (3,4), and such intoxication is considered endemic in Jamaica (5).

The Arizona State Department of Health Services is working with local health departments to disseminate information about this problem, particularly in Hispanic communities.

Episodes similar to the 2 reported here are probably occurring with increasing frequency because of the growing interest in and use of "natural" foods. Both outbreaks illustrate the importance of knowing exactly what one is drinking when experimenting with herbs or unfamiliar substances.

References

1. Lyford CL, Vergara GG, Moeller DD: Hepatic veno-occlusive disease originating in Ecuador. Gastroenterology 70:105-108, 1976
2. McLean EK: The toxic actions of pyrrolizidine (Senecio) alkaloids. Pharmacol Rev 22:429-483, 1970
3. Mohabbat O, Younos MS, Merzad AA, et al: An outbreak of hepatic veno-occlusive disease in northwestern Afghanistan. Lancet 2:269-271, 1976
4. Tandom BN, Tandom HD, Tandom RK, et al: An epidemic of veno-occlusive disease of the liver in central India. Lancet 2:271-272, 1976
5. Stuart KL, Bras G: Veno-occlusive disease of the liver. Q J Med 26:291-315, 1957

I. References

GENERAL

1. Foodborne Infections and Intoxications, Riemann H (ed). Academic Press, NY, 1969
2. Food Research Institute: Annual Report 1977, University of Wisconsin, Madison, Wisconsin.
3. Bryan FL: Emerging foodborne diseases. I. Their surveillance and epidemiology. II. Factors that contribute to outbreaks and their control. J Milk Food Technol 35:618-625, 632-638, 1972
4. Horwitz MA: Specific diagnosis of foodborne disease. Gastroent 73:375-381, 1977

BACTERIAL

Bacillus cereus

1. Goepfert JM, Spira WM, Kim HU: Bacillus cereus: Food poisoning organism. A review. J Milk Food Technol 35:213-227, 1972
2. Mortimer PR, McCann G: Food poisoning episodes associated with Bacillus cereus in fried rice. Lancet 1:1043-1045, 1974
3. Terranova W, Blake PA: Bacillus cereus food poisoning. N Eng J Med 298:143-144, 1978

Brucella

1. Spink WW: The Nature of Brucellosis. Minneapolis, Lund Press, Inc. 1956
2. Buchanan TM, et al: Brucellosis in the United States 1960-1972. Med 53: 403-439, 1974
3. Young EJ, Suvannaparrat U: Brucellosis outbreak attributed to ingestion of unpasteurized goat cheese. Arch Intern Med 135:240-243, 1975
4. Fox MD, Kaufman AF: Brucellosis in the United States, 1965-1974. J Infect Dis 136:312-316, 1977

Clostridium botulinum

1. Center for Disease Control: Botulism in the United States, 1899-1973. Handbook for Epidemiologists, Clinicians, and Laboratory Workers, CDC, Atlanta, June 1974, pp 7-11
2. Cherington M: Botulism. Ten-year experience. Arch Neurol 30:432-437, 1974
3. Koenig MG, Drutz DJ, Mushlin AI, et al: Type B botulism in man. Am J Med 42:208-219, 1967
4. Koenig MG, Spichard A, Cardella MA, et al: Clinical and laboratory observations of type E botulism in man. Med 43:517-545, 1964
5. Dowell VR Jr, McCroskey LM, Hatheway CL, et al: Coproexamination for botulinal toxin and Clostridium botulinum - A new procedure for laboratory diagnosis of botulism. JAMA 238:1829-1832, 1977

Clostridium perfringens

1. Bryan FL: What the sanitarian should know about Clostridium foodborne illness. J Milk Food Technol 32:381-389, 1969
2. Lowenstein MS: Epidemiology of Clostridium perfringens food poisoning. N Engl J Med 286(19):1026-1027, 1972

Escherichia coli

1. Marier R, Wells JG, Swanson RC, Callahan W, Mehlman IJ: An outbreak of enteropathogenic Escherichia coli foodborne disease traced to imported French cheese. Lancet 2:1376-1378, 1973
2. Sack RB: Human diarrheal disease caused by enterotoxigenic Escherichia coli. Ann Rev Microbiol 29:333-353, 1975

Salmonella

1. Aserkoff B, Schroeder SA, Brachman PS: Salmonellosis in the United States--A five-year review. Am J Epidemiol 92:13-24, 1970
2. Bryan FL: What the sanitarian should know about salmonellae and staphylococci in non-dairy foods. II. Salmonellae. J Milk Food Technol 31:131-140, 1968
3. Cohen ML, Blake PA: Trends in foodborne salmonellosis outbreaks: 1963-1975. J Food Protection 40:798-800, 1977

Shigella

1. Donadio JA, Gangarosa EJ: Foodborne shigellosis. J Infect Dis 119: 666-668, 1969
2. Black RE, Craun GF, Blake PA: Epidemiology of common-source outbreaks of shigellosis in the United States, 1961-1975. Am J Epidemiol 108:47-52, 1978

Staphylococcus

1. Bryan FL: What the sanitarian should know about salmonellae and staphylococci in non-dairy foods. I. Staphylococci. J Milk Food Technol 31:110-116, 1968
2. Merson MH: The epidemiology of staphylococcal foodborne disease. Proceedings of the Staphylococci in Foods Conference, Pennsylvania State University, University Park, Pennsylvania, 1973, pp 20-37
3. Minor TE, Marth EH: Staphylococcus aureus and staphylococcal food poisoning. J Milk Food Technol 34:21-29, 77-83, 227-241, 1972, 35:447-476, 1973

Group A Streptococcus

1. Hill HR, Zimmerman RA, Reid GVK, Wilson E, Kitton RM: Foodborne epidemic of streptococcal pharyngitis at the United States Air Force Academy. N Engl J Med 280:917-921, 1969
2. McCormick JB, Kay D, Hayes M, Feldman RA: Epidemic streptococcal sore throat following a community picnic. JAMA 236:1039-1041, 1976

Vibrio cholerae

1. Finkelstein RA: Cholera. CRC Critical Reviews in Microbiology 2(4):553-623, 1973
2. Gangarosa EJ, Mosley WH: Epidemiology and surveillance of cholera: Cholera, edited by Barua D, Burrows W. Philadelphia, London, Toronto, WB Saunders Co., 1974, p 381

Vibrio parahaemolyticus

1. International Symposium on Vibrio parahaemolyticus, September 17-18, 1973, Fujino, Sakaguchi G, Sakazaki R, Takeday (ed). Saikon Publishing Co., Ltd., Tokyo, Japan, 1974
2. Barker WH: Vibrio parahaemolyticus outbreaks in the United States. Lancet 1:551-554, 1974

3. Barrow GI, Miller DC: Vibrio parahaemolyticus and seafoods. Soc Appl Bacteriol Symp Ser 4:181-195, 1976

4. Dadisman TA Jr, Nelson R, Molenda JR, et al: Vibrio parahaemolyticus gastroenteritis in Maryland. I. Clinical and epidemiologic aspects. Am J Epidemiol 96:414-426, 1972

CHEMICAL

Heavy Metal

Cadmium

1. Baker TD, Hafnew WG: Cadmium poisoning from a refrigerator shelf used as an improvised barbecue grill. Public Health Rep 76:543-544, 1961

Copper

1. Hopper SH, Adams HS: Copper poisoning from vending machines. Public Health Rep 73:910-914, 1958

2. Semple AB, Parry WH, Phillips DE: Acute copper poisoning: an outbreak traced to contaminated water from a corroded geyser. Lancet 2:700-701, 1960

Tin

1. Barker WH, Runte V: Tomato juice-associated gastroenteritis. Washington and Oregon, 1969. Am J Epidemiol 96:219-226, 1972

Zinc

1. Brown MA, Thom JV, Orth GL, et al: Food poisoning involving zinc contamination. Arch Environ Health 8:657-660, 1964

Ichthyosarcotoxin

1. Hughes JM, Merson MH: Fish and shellfish poisoning. N Engl J Med 295: 1117-1120, 1976

Ciguatoxin

1. Barkin RM: Ciguatera poisoning. A common-source outbreak. South Med J 67(1):13-16, 1974

2. Halstead BW: Poisonous and venomous marine animals of the world. Princeton, The Darwin Press, 1978, pp 325-402

Puffer Fish (tetrodotoxin)

1. Halstead BW: Poisonous and venomous marine animals of the world. Princeton, The Darwin Press, 1978, pp 437-548

2. Torda TA, Sinclair E, Ulyatt DB: Puffer fish (tetrodotoxin) poisoning: Clinical record and suggested management. Med J Aust 1:599-602, 1973

Scombrotoxin

1. Halstead BW: Poisonous and venomous marine animals of the world. Princeton, The Darwin Press, 1978, pp 417-435

2. Kimata M: The histamine problem: Fish as Food, edited by Borgstrom E, New York, Academic Press, 1961, pp 329-352

3. Merson MH, Baine WB, Gangarosa EJ, Swanson RC: Scombroid fish poisoning: outbreak traced to commercially canned tuna fish. JAMA 228:1268-1269, 1974

Monosodium Glutamate

1. Schaumburg HH, Byck R, Gerstl R, Mashman JH: Monosodium L-glutamate; its pharmacology and role in the Chinese restaurant syndrome. Science 163:826-828, 1969

Mushroom Poison

1. Wieland T, Wieland O: The toxic peptides of Amanita species in Kadis S, Cregler A, Alj SJ (eds): Microbial toxins, Vol 8 Fungal toxins,New York and London, Academic Press, 1972, pp 249-280
2. Benedict RG: Mushroom toxins other than Amanita, Kadis S, Ciegler A, Ajl SJ: Microbial toxins, vol 8 Fungal toxins, New York and London, Academic Press, 1972, pp 281-320
3. Tyler VE: Poisonous mushrooms: Progress in Chemical Toxicology. Vol 1, edited by Stolman A, New York, Academic Press, 1963, pp 339-384
4. Becker CE, et al: Diagnosis and treatment of Amanita phalloides type mushroom poisoning - use of thiotic acid. West J Med 125:100-109, 1976

Paralytic and Neurotoxic Shellfish Poison

1. Music SI, Howell JT, Brumback CL: Red tide: its public health implications. J Fla Med Assoc 60:27-29, 1973
2. Halstead BW: Poisonous and venomous marine animals of the world. The Darwin Press, Princeton, 1978, pp 43-78
3. Hughes JM, Merson MH: Fish and shellfish poisoning. N Engl J Med 295: 11117-1120, 1976

PARASITIC

Anisakidae

1. Chitwood MD: Nematodes of medical significance found in market fish. Am J Trop Med Hyg 19:599-602, 1970

T. spiralis

1. Gould SE: Trichinosis in man and animals. Springfield, Ill, Charles C. Thomas, 1970
2. Zimmerman WJ, Steele JH, Kagan IG: Trichinosis in the U.S. population 1966-1970--prevalence and epidemiologic factors. Health Services Rep 88:606-623, 1973

T. gondii

1. Kean BH, Kimball AC, Christensen WN: An epidemic of acute toxoplasmosis. JAMA 208:1002-1004, 1969

VIRAL

Hepatitis A

1. Cliver DO: Implications of foodborne infectious hepatitis. Public Health Rep 81:159-165, 1966
2. Gravelle CR, Hornbeck CL, Maynard JE, et al: Hepatitis A: Report of a common-source outbreak with recovery of a possible etiologic agent. II. Laboratory studies. J Infect Dis 131:167-171, 1975
3. Leger RT, Boyer KM, Pattison CP, et al: Hepatitis A: Report of a common-source outbreak with recovery of a possible etiologic agent. I. Epidemiologic studies. J Infect Dis 131:163, 1975

4. Denes AE, Smith JL, Hindman SH, et al: Foodborne hepatitis A infection: A report of two urban restaurant-associated outbreaks. Am J Epidemiol 105:156-162, 1977

IV. WATERBORNE DISEASE OUTBREAKS, 1977

In 1977, 34 waterborne disease outbreaks were reported to the Center for Disease Control for the United States, a decrease of 3% from 1976.

A. Definition of Terms

In this report a waterborne disease outbreak is defined 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 intended or used for drinking are included.

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 those 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 populated areas (e.g., backpackers). These definitions correspond closely to those used in the safe drinking water act (PL93-523).

B. Sources of Data

Waterborne disease outbreaks are reported to CDC by state health departments. 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 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. A standard reporting form that was pretested in 8 states is now being used (see Section E). Data obtained on outbreaks are reviewed and summarized by representatives from CDC and EPA. A line listing of reported waterborne disease outbreaks in 1977 is included (see Section F).

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 1977 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 1977, 34 waterborne disease outbreaks, a decrease of 3% from 1976 (35 outbreaks), and 3,860 cases, a decrease of 24% from 1976 (5,068 cases), were reported to CDC (Table 1). However, the number of outbreaks reported in 1976 (35) and 1977 (34) represents a 33% increase over the 4-year average for 1972-75 (26). Increased reporting by certain states probably accounts for the increased number of recorded outbreaks in 1976 and 1977. As in 1976, Pennsylvania accounted for more than one-fourth of all reported outbreaks (10 of 34, 29%).

Figure 1 shows the geographic distributions of outbreaks by states. Nineteen states reported at least 1 outbreak. Figure 2 depicts the trend in reported waterborne disease outbreaks in the period 1938-1977.

Table 2 shows the number of outbreaks and cases by etiology and type of water system. Of 34 outbreaks, 20 (59%) 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 14 (41%) outbreaks of known etiology: chemical (6), Giardia lamblia (4), Salmonella (2), Shigella (1), and hepatitis A (1). In 3 of the 5 largest outbreaks an etiologic agent was found, Giardia lamblia, in a municipal water system in New Hampshire (750 cases), photographic developer fluid (hydroquinone) aboard a U.S. Navy vessel in California (531 cases), and Salmonella typhimurium in a municipal water system in Iowa (206 cases). There were 3 outbreaks caused by contaminated ice and 1 outbreak in which contaminated water was used to make whipped cream, the vehicle of infection.

The 6 chemical outbreaks were due to toxic amounts of copper (3) (4.0, 12.5, and 38.5 mg/liter), fluoride (24 mg/liter), photographic developer, and gasoline (10 mgm/liter of leaded gasoline). The 3 outbreaks attributed to copper represent problems associated with the leeching of copper from plumbing. In 1 outbreak, naturally corrosive water with a low pH in contact with copper plumbing caused high levels of copper to be dissolved into the drinking water; in another, pH adjustment of naturally corrosive water was interrupted allowing copper to be leeched from plumbing; and in another, a defective check valve allowed carbon dioxide from a drinking dispensing machine to flow into the drinking water system lowering the pH and making the water corrosive to copper plumbing.

In the 28 non-chemical outbreaks results of microbiologic tests of water samples were reported in 21; evidence of contamination (presence of coliforms or pathogens) was found in 86% (18/21). In the 4 outbreaks of giardiasis, Giardia cysts were identified in the water supply in the New Hampshire outbreak and were not identified or results were unknown in the remaining 3 (Montana (2), Utah). Results of microbiologic examination were known in 3 of the Giardia outbreaks and only 1 (Utah) were coliforms (80 MPN/100 ml) identified. 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 (56%) and municipal (35%) water systems, and fewer involved individual (9%) systems (Table 3). This distribution is similar to that seen in 1976. Outbreaks attributed to water from municipal systems affected an average of 191 persons compared with 81 persons in outbreaks involving semipublic systems and 11 persons in outbreaks associated with individual water systems. Deficiencies in treatment (inadequately or untreated water) accounted for 26 (76%) of the outbreaks. Untreated water (surface or ground) accounted for 14 of these 26 outbreaks.

Of the 19 outbreaks associated with semipublic water supply systems, 15 (79%) involved visitors to areas used mostly for recreational purposes. Of these 15, 13 occurred in the summer months May through September (Table 4).

E. Comments

The 33% increase in the number of outbreaks reported in 1976 and 1977 is probably due to more complete reporting. Diligent investigation, such as was done in outbreaks reported from Pennsylvania and California, 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 1977; more than half occurred in camping areas. Water systems used on a seasonal basis or those that do not usually have an overwhelming demand placed upon them by large numbers of visitors are now 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 outbreaks that occurred in 1975 in Crater Lake National Park (more than 1,000 cases) and in 1977 in Yellowstone National Park (more than 400 cases) 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 interpreted as providing assurance that the water is free of enteric pathogens. This interpretation must be re-evaluated in light of data available from waterborne outbreaks of giardiasis.

In 1977, as in 1976, outbreaks of giardiasis (4) continued to occur. In 3 of the outbreaks in which coliform counts were reported, only 1 (Utah) showed evidence of water contamination. In the New Hampshire outbreak and 1 of the Montana outbreaks (200 cases) the water came from a surface supply and was chlorinated but received no pretreatment (coagulation/flocculation, settling and filtration - Montana), or received inadequate or defective pretreatment (New Hampshire - 2 water supply plants involved). Although adequate disinfection data are not currently available, it is felt that Giardia cysts are as resistant to chlorination as cysts of Entamoeba histolytica, and therefore, high concentrations of chlorine and long contact times would be required for cyst inactivation. Almost all of the outbreaks of giardiasis documented in the United States since 1965 have occurred as a result of drinking untreated surface water or surface water in which the 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, whereas coliforms would not. The coliform test in these situations would not provide assurance that an outbreak of giardiasis would be prevented.

To limit the possibility of Giardia contamination of a surface water supply, the watershed should be protected from human and if possible from wildlife contact. Since this is not practical in most instances, water treatment in addition to disinfection is needed to remove such cysts. Water filtration theories indicate 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 mangenese removal and for a number of reasons are generally not considered effective for microbiologic treatment. In Giardia outbreaks that have occurred in filtered supplies, treatment and operational deficiencies have been identified. Available data would indicate that well-operated conventional treatment plants employing coagulation/flocculation, settling, and filtration are successful in preventing outbreaks of giardiasis.

The outbreak of hepatitis A occurred after an unknown cross connecting pipe was accidentally broken during the repair of a septic tank inflow line. Sewage discharging from the septic tank line entered the broken piping that connected directly to a nearby (50 yards) unchlorinated ground water well which had previously provided safe drinking water. This outbreak illustrates the hazards of contaminating an established safe source during nearby repair work involving pipes and sewerage lines. During such repairs, unchlorinated drinking supplies should be temporarily chlorinated and such water should be closely monitored bacteriologically during and for some time after the repair work is completed to insure their potability.

Fig. 1 WATERBORNE DISEASE OUTBREAKS, 1977

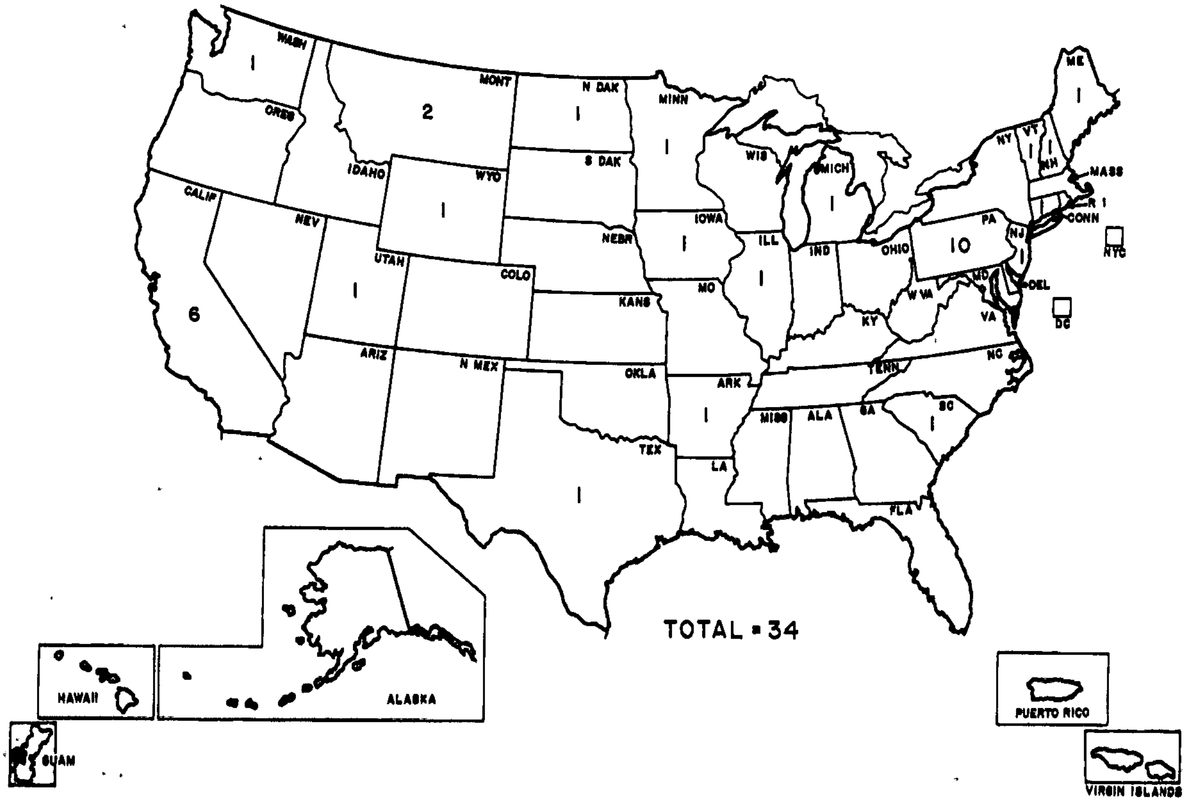


Fig. 2 AVERAGE ANNUAL NUMBER WATERBORNE DISEASE OUTBREAKS, 1938 - 1977

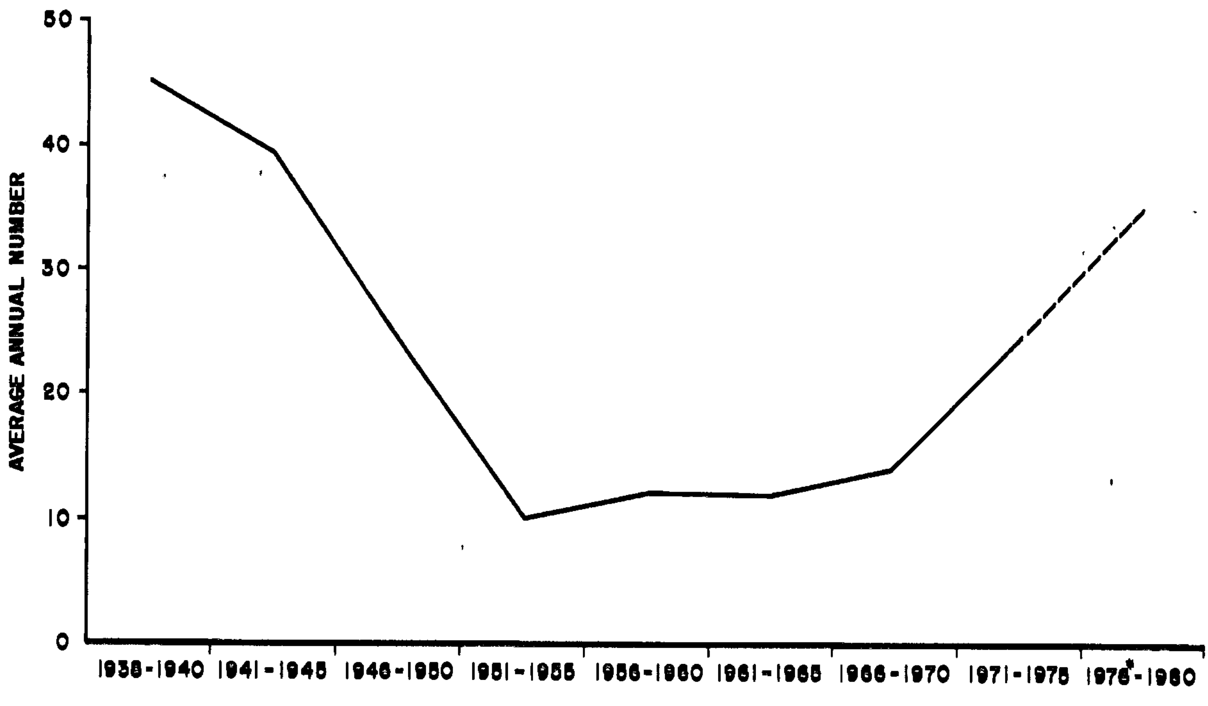


Table 1

Waterborne Disease Outbreaks, 1972-1977

	1972	1973*	1974*	1975	1976	1977	Total
Outbreaks	29	26	25	24	35	34	173
Cases	1,638	1,774	8,356	10,879	5,068	3,860	31,575

*Revised totals

Table 2

Waterborne Disease Outbreaks, by Etiology and Type of Water System, 1977

	MUNICIPAL		SEMIPUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Acute gastrointestinal illness	5	518	13	1,396	2	24	20	1,938
Chemical poisoning	4	612	1	11	1	10	6	633
Giardiasis	2	950	2	62	0	0	4	1,012
Salmonellosis	1	206	1	7	0	0	2	213
Hepatitis	0	0	1	47	0	0	1	47
Shigellosis	0	0	1	17	0	0	1	17
TOTAL	12	2,286	19	1,540	3	34	34	3,860

Table 3

Waterborne Disease Outbreaks, by Type of System, and Cause of System Deficiency, 1977

	MUNICIPAL		SEMIPUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Untreated surface water	1	200	1	55	1	12	3	267
Untreated ground water	0	0	9	547	2	22	11	569
Treatment deficiencies	4	1,362	8	891	0	0	12	2,253
Deficiencies in distribution system	6	718	1	47	0	0	7	765
Miscellaneous	1	6	0	0	0	0	1	6
TOTAL	12	2,286	19	1,540	3	34	34	3,860

Table 4

Waterborne Disease Outbreaks Involving Semipublic Water Supplies, by Month, and Population Affected, 1977

Month	Number of Outbreaks	Usual Population*	Visitors**
January	1	1	-
February	-	-	-
March	-	-	-
April	1	-	1
May	3	-	3
June	2	-	2
July	8	2	6
August	2	-	2
September	-	-	-
October	1	-	1
November	1	1	-
December	-	-	-
TOTAL	19	4	15

*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, 1977

Month	Number of Outbreaks	Month	Number of Outbreaks
January	3	July	13
February	0	August	3
March	1	September	1
April	2	October	2
May	4	November	2
June	2	December	1

TOTAL 34

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

F. INVESTIGATION OF A WATERBORNE OUTBREAK

Form Approved
OMB No. 68-R0557

1. Where did the outbreak occur?

________________ (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)*:

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

☐ Well	a	b	c	d	a. no treatment
☐ Spring	a	b	c	d	b. disinfection only
☐ Lake, pond	a	b	c	d	c. purification plant — coagulation, settling, filtration, disinfection *(circle those applicable)*
☐ River, stream	a	b	c	d	d. other ________________

10. Point where contamination occurred: (66)

☐ Raw water source ☐ Treatment plant ☐ Distribution system

*See CDC 4.245 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
11-78

This report is authorized by law (Public Health Service Act, 42 USC 241).
While your response is voluntary, your cooperation is necessary for the understanding and control of the disease.

12. 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.		

13. 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

15. 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.

16. 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 rock
- ☐ Other (specify) ______

17. Etiology: (69-70)

Pathogen ______
Chemical ______
Other ______

(71)
Suspected 1
Confirmed . . . . 2 *(Circle one)*
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 water; epidemic curve; control measures implemented; etc. (Attach 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)
?-76

G. LINE LISTING OF WATERBORNE DISEASE OUTBREAKS, 1977

G. Line Listing of Waterborne Disease Outbreaks, 1977

State	Month	Disease	Cases	Type of System	Location of Outbreak	System Deficiency*
Arkansas**	July	*Salmonella javiana*	7	Semipublic	Trailer Camp	3
California	July	Acute gastrointestinal illness	63	Semipublic	Camp	3
California	July	Acute gastrointestinal illness	203	Semipublic	Camp	3
California	July	Developer Fluid	531	Municipal	U.S. Navy ship	4
California	August	Acute gastrointestinal illness	75	Semipublic	Camp	2
California	September	Acute gastrointestinal illness	12	Individual	Camp	2
California	December	Acute gastrointestinal illness	6	Municipal	Restaurant	5†
Connecticut	October	Copper††	3	Municipal	College	4
Illinois	May	Acute gastrointestinal illness	154	Semipublic	Restaurant	2
Iowa	July	*Salmonella typhimurium*	206	Municipal	Residence	3
Maine	July	Acute gastrointestinal illness	91	Semipublic	Camp	2
Michigan	November	Fluoride	4	Municipal	Residence	3
Minnesota	June	Acute gastrointestinal illness	13	Semipublic	Resort	2
Montana	July	Giardiasis	55	Semipublic	Hotel	1

Montana	July	Giardiasis	200	Municipal	Residence	1[†††]
New Hampshire	April	Giardiasis	750	Municipal	Residence	3
New Jersey	April	Acute gastrointestinal illness	10	Semipublic	Camp	2
North Dakota	August	Acute gastrointestinal illness	25	Municipal	Motel	4[†]
Pennsylvania	January	Gasoline	10	Individual	Residence	2
Pennsylvania	January	*Shigella sonnei*	17	Semipublic	Apartment	2
Pennsylvania	January	Acute gastrointestinal illness	73	Municipal	Restaurant	4[†]
Pennsylvania	May	Acute gastrointestinal illness	500	Semipublic	Restaurant	3
Pennsylvania	May	Acute gastrointestinal illness	30	Semipublic	Restaurant	2
Pennsylvania	July	Acute gastrointestinal illness	47	Semipublic	Camp	3
Pennsylvania	July	Acute gastrointestinal illness	15	Semipublic	Camp	3
Pennsylvania	August	Acute gastrointestinal illness	150	Semipublic	Camp	2
Pennsylvania	October	Acute gastrointestinal illness	45	Semipublic	Camp	3
Pennsylvania	November	Copper	11	Semipublic	School	3
South Carolina	July	Hepatitis A	47	Semipublic	Factory	4
Texas	May	Acute gastrointestinal illness	12	Municipal	Residence	4

State	Month	Disease	Cases	Type of System	Location of Outbreak	System Deficiency*
Utah	June	Giardiasis	7	Semipublic	Camp	2
Vermont	March	Copper	74	Municipal	Restaurant	4
Washington	July	Acute gastrointestinal illness	12	Individual	Hikers	1
Wyoming	July	Acute gastrointestinal illness	402	Municipal	Park	3

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

**Occurred in 1976 but not reported until 1977

†Contaminated ice

††Drinking water used for washing - affected hair color

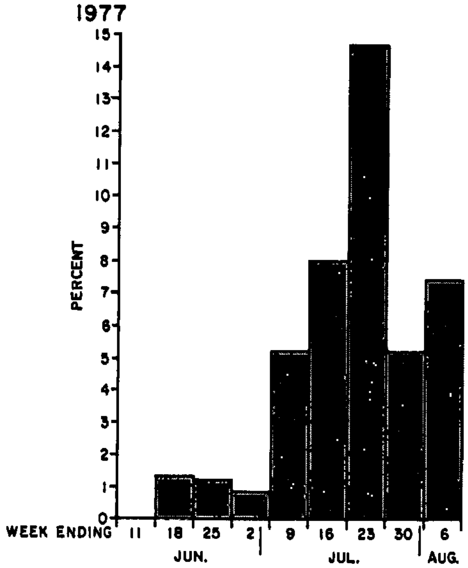
†††Surface water with chlorination only

H. Selected Waterborne Outbreak Articles, 1977, Taken from Morbidity and Mortality Weekly Report

Gastroenteritis -- Yellowstone National Park, Wyoming
(MMWR 26(34):283, 1977)

An outbreak of mild gastroenteritis presumed to be viral in etiology began early in July in Yellowstone National Park. The center of the outbreak was Canyon Village, a small, centrally located town in the park which provides lodging accommodations, campsites, and eating facilities for tourists. A survey by CDC on August 6 of Canyon Village employees revealed an attack rate of 32% since June 1, with a peak attack rate of nearly 15% for the week ending July 23 (Figure 3). The disease was characterized by the acute onset of vomiting or diarrhea, which lasted approximately 24 hours.

Fig. 3 ATTACK RATE OF GASTROENTERITIS IN CANYON VILLAGE EMPLOYEES, BY WEEK, JUNE—AUGUST, 1977



In Lake Village, 17 miles south of Canyon Village, and Old Faithful Village, 42 miles west of Canyon Village, outbreaks also occurred in July; overall attack rates for these 2 villages were approximately 15%. In Lake Village the peak occurred during the week ending July 30, when the attack rate was 3.7%.

Initially, investigation suggested a common-source outbreak temporally associated with the use of a secondary water source. The primary water source for Canyon Village is Soda Creek, a small mountain stream. When it is not sufficient, Cascade Creek, an unprotected surface water source which originates at Cascade Lake and runs approximately 4 miles to a small reservoir, is used as an auxiliary water source. Because of inadequate rain this summer, Cascade Creek has been used intermittently every day since June 29, except for 2 days - July 24-25 - when there was adequate rainfall. These 2 days occurred in the week ending July 30, which had a decrease in the attack rate for Canyon Village (Figure 1).

Among employees in Canyon Village, those who drank an average of more than 5 glasses of water per day were at a significantly higher risk of contracting gastroenteritis than those who drank 2 glasses or less ($p<0.05$). Furthermore, employees who boiled their water were at significantly less risk of having gastroenteritis than those who drank water without boiling it ($p<0.05$). Among visitors to Yellowstone Park surveyed on August 8, those who visited Canyon Village and drank more than 2 glasses of water per day while in the park were at significantly higher risk of having gastroenteritis than those who did not drink this much water or visit Canyon Village ($p<0.001$).

Fluorescent dye studies to determine if there are any cross-connections between the sewage and water supplies are underway.

Although water was the probable source of some cases, other factors suggested person-to-person transmission for many cases in the 3 villages. Social intermingling among employees in these villages is commonplace, and surveys in Canyon Village documented that roommates of persons ill with gastroenteritis were at a significantly higher risk of becoming ill than roommates of well persons ($p<0.001$). Among Park Service personnel, individuals residing in dormitories were at a significantly higher risk than those residing in trailers or apartments ($p<0.01$), suggesting that person-to-person spread was occurring, particularly in areas of community living.

On August 12, the Canyon Village water supply was chlorinated to a free chlorine residual of 1 ppm. A memorandum

was issued to all park employees advising them of the problem and urging them, if ill with vomiting, diarrhea, or nausea, to report such illness to the Yellowstone Medical Service. Ongoing surveillance was also established with a questionnaire for each person identified by the clinic as having compatible symptoms. On August 18 cases were still occurring, and the Park Service was advised by CDC to avoid using Cascade Creek water for human consumption. On August 20 a temporary water system utilizing the Yellowstone River was established to be used by Canyon Village for the rest of this season. It was also recommended that a meeting be held later this summer to develop plans to correct deficiencies in the Canyon Village water supply before the opening of the park next spring.
Reported by M Smith, MD, Yellowstone Medical Service; MD Skinner, MD, State Epidemiologist, Montana State Dept of Health and Environmental Sciences; and Enteric and Neurotropic Diseases Br, Viral Diseases Div, CDC.

Hydroquinone Poisoning Aboard a Navy Ship
(MMWR 27(28):237-238,243, 1978)

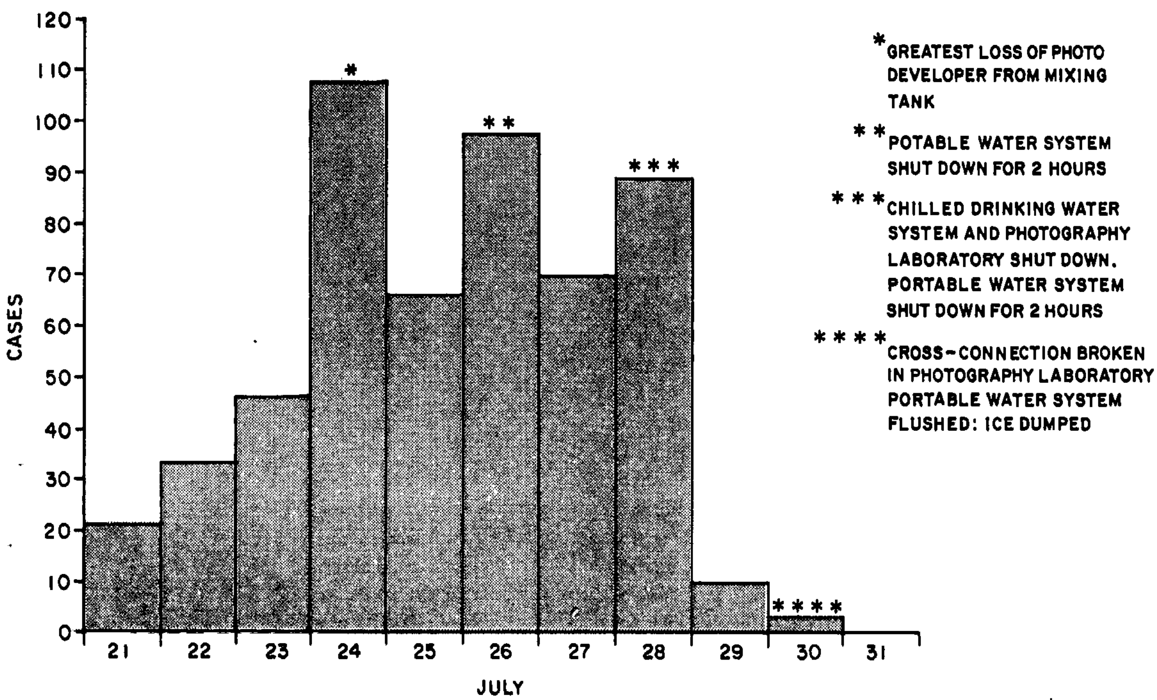
Between July 21-31, 1977, 544 crewmen aboard a large U.S. Navy vessel developed gastrointestinal disease (Figure 4). The illness was characterized by the acute onset of nausea, vomiting, abdominal cramps, and diarrhea generally resolving within 12-36 hours. Patients were usually afebrile but had elevated white blood cell counts. Stool and vomitus cultures from patients as well as cultures of water and various foods failed to yield any bacterial pathogens.

On the morning of July 28, when reporting for their required morning roll call, 301 men from 4 units with high attack rates were interviewed. Fifty-five of these individuals met the definition of a case (vomiting during the last 7 days), leaving 246 controls. Interview responses indicated that cases were significantly more likely to have drunk water while the ship was at sea ($p < .001$), implicating the ship's water system.

On July 19, 2 days prior to the onset of the outbreak, a chilled drinking water system to the forward part of the ship was used for the first time in 1½ years. Because the time relationship implicated this system, it was shut down July 28. Within the next 24 hours, there was a reduction in the number of cases (Figure 1).

Subsequently, it was learned that the chilled water system supplied water to automatic photo-developing machines on the ship. A makeshift cross-connection (a rubber hose) was detected leading from a 40-gallon tank used to mix photographic developer to the ship's potable water system, which supplied water throughout the ship. When the chilled water system was shut down on July 28, the mixing of photographic developer in the tank ceased. Only 13 more cases were detected after that time.

Fig. 4 GASTROENTERITIS ON A LARGE NAVAL VESSEL, JULY 21-31, 1977



Chemical analysis of water specimens taken shortly after the connecting hose had been removed showed non-toxic levels of lead, nickel, and dissolved solids; the pH was in an acceptable range. No hydroquinone, a chemical used in photographic developing, was found in the water samples. However, subsequent liquid chromatographic analysis of serum specimens of 6 ill patients found it to be present in 3 specimens (>.1μg/ml); no hydroquinone was found in specimens from 6 non-ill controls.

Editorial Note: Hydroquinone, 1, 4 dihydroxybenzene, is used extensively as a photographic developer and in the manufacture of certain dyes. The most common toxic exposures are from aerosolized materials (fumes) affecting the eyes and skin; this can lead to depigmentation and corneal lesions. Ingestion of this compound results in gastrointestinal symptoms, such as those described in this outbreak. Heavier exposure can cause convulsions, cardiovascular collapse, pulmonary edema, and systemic acidosis. Rarely, hydroquinone has been etiologically implicated in methemoglobinemia and renal and hepatic failure. Therapy is limited to general supportive measures and to oral administration of activated charcoal or vegetable oils to absorb any of the chemical remaining in the gastrointestinal tract (1, 2).

References

1. Gosselin RE, Hodge HC, Smith RP, Gleason MN: Clinical Toxicology of Commercial Products. 4th ed. Baltimore, Williams and Wilkins Co., 1976, p 127
2. Hunter D: The Diseases of Occupations. 4th ed. Boston, Little, Brown and Company, 1969, pp 532-534

Outbreak of Acute Gastroenteritis Due to Copper Poisoning -- Vermont
(MMWR 26(27):218,223, 1977)

Three employees at a Vermont hospital became ill with nausea and vomiting on the afternoon of March 28, 1977, within 5 minutes after consuming a carbonated soft drink in the hospital coffee shop. A survey of hospital employees revealed 46 additional individuals who had onset of gastrointestinal symptoms during the afternoon or evening of the same day. Of 231 individuals who ate or drank in the coffee shop, 38 developed illness versus 11 of 461 employees who did not visit the coffee shop (x^2=44.1 p<0.01). Of the 189 employees who drank, with or without ice, water or carbonated beverages made from this water, 36 became ill versus 1 of 39 employees who did not consume one of these beverages (x^2=5.3 p<0.02). (A beverage history was not available on the other ill individual who had visited the coffee shop.) Twenty-one of these 36 ill individuals had onset within 2 hours of being in the coffee shop.

Samples of water and of ice produced in an ice machine on the same water distribution system indicated pH levels below 5.4 (the normal water pH level for this community is 6.8) and the presence of a blue precipitate. After resuspension of the precipitate in the laboratory, the copper levels in the water and ice samples ranged from 7-70 mg/1. (The Environmental Protection Agency recommends that copper in public water supply sources not exceed 1 mg/1[1]). Blood and stool samples for copper were normal in those individuals tested, but samples were collected more than 24 hours after illness ended.

The carbonated beverages were dispersed from a machine that was supplied by carbonated water produced in a system adjacent to the machine. Carbon dioxide gas from pressurized tanks was mixed with water to form the carbonated water used in the soft drink dispenser. A defective check valve had permitted the CO_2 gas and carbonated water to flow back into the copper piping of the hospital water system. Leaching of the copper from the pipes resulted in high levels of copper in the water supplied to the beverage and ice machines and to the tap.

Reported by AJ Hamel, Medical Center Hospital of Vermont, Burlington; R Drawbaugh, MS, AM McBean, MD, WN Watson, MD, Acting State Epidemiologist, LE Witherell, PE, MPH, Vermont State Dept of Health; and Environmental Hazards Activity, Chronic Diseases Div, Bur of Epidemiology, CDC.

Editorial Note: Ingestion of beverages containing high concentrations of copper (2), zinc (3), and tin (4) has been associated with acute gastroenteritis within one hour of exposure. No chronic systemic effects have been noted in such acute exposures. Leaching of metals from the lining of storage containers by acidic beverages has been the usual mechanism of beverage contamination. Although these substances may impart an unpleasant taste to the beverage (the taste threshold for copper is 1.0 - 5.0 mg/1) (1), soft drink flavoring may mask the objectionable taste.

References

1. Environmental Studies Board, National Academy of Sciences, National Academy of Engineering: Water Quality Criteria 1972. Washington, D.C., the Environmental Protection Agency, 1973
2. Semple AB, Pang WH, Phillips DE: Acute copper poisoning: An outbreak traced to contaminated water from a corroded geyser. Lancet 2:700-701, 1960
3. Brown MA, Thom JV, Orth GL, et al: Food poisoning involving zinc contamination. Arch Environ Health 8:657-660, 1964
4. Barker WH, Runte V: Tomato juice-associated gastroenteritis. Washington and Oregon, 1969. Am J Epidemiol 96:219-226, 1972

I. Selected Waterborne Disease References

1. Craun GF, McCabe LJ: Review of the causes of waterborne disease outbreaks. J Am Water Works Assoc 65:74-84, 1973
2. Craun GF, McCabe LJ, Hughes JM: Waterborne disease outbreaks in the U.S. 1971-1974. J Am Water Works Assoc 68:420-424, 1976
3. Black RE, Horwitz MA, Craun GF: Outbreaks of waterborne disease in the U.S. 1975. JID 137:370-374, 1978
4. Rosenberg ML, Koplan JP, Wachsmuth IK, Wells JG, et al: Epidemic diarrhea at Crater Lake from enterotoxigenic <u>Escherichia coli</u>. Ann Intern Med 86:714-718, 1977
5. Shaw PK, Brosdky RE, Lyman DO, Wood BT, et al: A communitywide outbreak of giardiasis with evidence of transmission by a municipal water supply. Ann Intern Med 87:426-432, 1977
6. Rosenberg ML: A guide to the investigation of waterborne outbreaks. J Am Water Works Assoc 69:648-652, 1977
7. Collaborative Report. A waterborne epidemic of salmonellosis in Riverside, California, 1965. Am J Epidemiol 93:33-48, 1971
8. Feinglass EJ: Arsenic intoxication from well water in U.S. N Engl J Med 288:828-830, 1973
9. Weissman JB, Craun GF, Lawrence DN, Pollard RA, et al: An epidemic of gastroenteritis traced to a contaminated public water supply. Am J Epidemiol 103:391-398, 1976
10. Blake PA et al: Cholera in Portugal in 1974. II. Transmission by bottled mineral water. Am J Epidemiol 105:344-348, 1977

V. ARTICLES ON CRUISE SHIP OUTBREAKS TAKEN FROM MORBIDITY AND MORTALITY WEEKLY REPORTS

Gastrointestinal Illness Aboard the T.S.S. Fairsea
(MMWR 26(21):176, 1977)

Outbreaks of gastrointestinal illness occurred on 3 consecutive voyages of a cruise ship, the T.S.S. Fairsea. The first cruise (April 23-30) and the second cruise (April 30-May 7) were 7-day round trip cruises from Los Angeles with 1-day visits to 2 ports in Mexico. The third cruise (May 7-21) was a 14-day cruise from Los Angeles to San Juan, Puerto Rico, with visits to 2 ports in Mexico and 4 in the Caribbean.

On the first cruise an outbreak of gastrointestinal illness began late April 24 and peaked on the third day of the cruise before reaching the first Mexican port. A questionnaire survey revealed that 514 passengers (58%) and 22 crew members (5%) were ill. None of these crew members worked in food preparation. The illness was characterized by diarrhea, vomiting, and abdominal cramps with headache reported in approximately half and fever reported in approximately one-quarter of cases. Symptoms lasted 2 days or less in 92% of ill individuals. Illness was not associated with any meal or food item, but risk of illness did increase with increasing consumption of water ($p=.002$). Approximately 200 passengers visited the ship's physicians. Stool specimens were negative for Salmonella, Shigella, Vibrio parahaemolyticus, Bacillus cereus, and Yersinia enterocolitica. One culture grew toxigenic Escherichia coli. Viral studies are pending. A sanitary inspection of the vessel failed to reveal any major deficiency in food or water handling, and the water distribution system had adequate residual chlorine. No coliform bacteria were found in water and ice samples.

On the second cruise, 30 of approximately 900 passengers visited the ship's physicians for a gastrointestinal illness similar to, but milder than, that seen on the first cruise. A telephone survey of 61 randomly selected passengers found that 30 (49%) individuals reported illness. The outbreak peaked on the fifth day of the cruise.

On the ninth day of the third cruise, 20 passengers reported to the ship's physicians for treatment of gastroenteritis, increasing the number seen since the beginning of the voyage to 29. An investigation found that 289 passengers (37%) and 7 crew members (2%) reported a gastrointestinal illness during the first 11 days of the third cruise, with the peak incidence occurring on the ninth day. None of the ill crew members were kitchen workers. The symptoms were similar to and as mild as those reported by passengers on the second cruise, and the duration of illness was usually 1-2 days. An increases risk of illness was again associated with consumption of increasing amounts of water ($p=.007$). Stool specimens were obtained for bacterial and viral studies. A sanitary inspection again revealed adequate chlorine levels in the water distribution system and no major deficiencies in food handling. No coliform bacteria were isolated from water and ice samples obtained on May 20, when the ship docked in St. Thomas. The environmental investigation revealed that bilge water sometimes covered the suction line from one of the fresh water storage tanks. Water from this storage tank was used twice during the outbreak period of the May 7-21 cruise, but at no time immediately before or during the outbreak periods of the April 23-30 and April 30-May 7 cruises. This defect was corrected before the ship departed on its present cruise.

Editorial Note: The cause and source of these 3 outbreaks remain unknown. CDC is continuing to investigate the ship's water distribution system, to monitor gastrointestinal illness during the current cruise, and to process laboratory specimens. During the third consecutive outbreak of gastrointestinal illness, CDC requested that the cruise line inform all passengers booked for the May 21-June 4 cruise of the situation. The cruise line sent telegrams to travel agents stating the existence of these 3 consecutive, and increasingly mild, outbreaks of gastroenteritis and informing them of the unknown risk of similar illness to future passengers.

Gastroenteritis Caused by Vibrio parahaemolyticus Aboard a Cruise Ship
(MMWR 27(9):65, 1978)

An outbreak of gastrointestinal illness occurred aboard the S/S Statendam, a Caribbean cruise ship of Dutch registry, on its December 2-11 voyage. The outbreak was uncovered on December 8, 1977, when a U.S. Quarantine Officer boarded the ship in St. Thomas, U.S. Virgin Islands, to conduct a follow-up inspection of sanitary deficiencies noted during a previous voyage. A routine review of the physician's log revealed that 29 (4%) of 671 passengers and 7 (2%) of 388 crew members had reported illness between December 3 and 7. However, the ship had not notified health officials of the illness on board, as required by U.S. Quarantine Regulations, before docking in San Juan on December 7 or in St. Thomas the next day. Following these findings, an epidemiologic and environmental investigation was begun on December 8.

Eighty-six (13%) of 660 passengers and 12 (3%) of 376 crew members responding to a questionnaire survey on December 9 reported suffering a gastrointestinal illness (defined as at least 3 or more loose stools per day or vomiting and abdominal cramps). Most passengers and crew members became ill on December 3 and 4, but cases occurred on each day of the cruise including December 8. The duration of illness ranged from 1 to 8 days with a median of 1 day.

Illness was equally distributed among male and female and Dutch and non-Dutch passengers as well as Indonesian and non-Indonesian crew members. It occurred with equal frequency among passengers from each deck and from each sitting in the dining room.

Analysis of food-specific attack rates for items consumed by passengers on the evening of December 2, the first evening of the voyage, showed a significant association between illness and consumption of seafood salad ($p=.02$). There was no association between illness and consumption of water or ice.

Laboratory analyses were performed on rectal swab specimens, food samples, and water samples. Vibrio parahaemolyticus was cultured at CDC from 8 of 10 rectal swabs from ill passengers but from none of 10 rectal swabs from well controls. Seven of the isolates were type 03:K33; 1 was type 05:K negative. All were Kanagawa positive. Samples of the actual seafood salad served on the evening of December 2 were not available for analysis; an attempt to isolate the organism from samples of the precooked seafood used in making the seafood salad was unsuccessful. Water samples obtained while the ship was in St. Thomas showed adequate levels of residual chlorine and were negative for coliform organisms.

An environmental inspection revealed several defects in food handling. Precooked, thawed seafood was stored before it was served in the same refrigerator with uncooked seafood, and leftover prepared foods were saved for use the next day. Other sanitary deficiencies, including the incorrect calibration of the ship's automatic chlorinator, which had been noted and brought to the attention of the ship's captain during a previous voyage, were also identified. Galley personnel denied using salt water from the ship's fire control system in the galley.

Editorial Note: Outbreaks of V. parahaemolyticus gastroenteritis aboard cruise ships, though infrequent, have been reported (1). The common denominator in these previous episodes was the use of salt water from the ship's fire control system in the galley to thaw frozen seafood or to wash fresh seafood. Although galley personnel on the S/S Statendam denied such practices, the other food-handling deficiencies identified could have resulted in cross-contamination of the precooked frozen seafood used in the seafood salad.

According to the Public Health Service laws and regulations, the Master of the S/S Statendam was required to notify the San Juan Quarantine Station of the illness on board before arrival. Had the follow-up inspection not been conducted, this failure to comply could have resulted in the outbreak's going unrecognized. CDC had apprised the cruise ship company of the seriousness of the violation and has informed them that any future breach will result in further action, as provided by law.

Reference

1. MMWR 24:109-110, 1975

VI. ARTICLES ON FOODBORNE AND WATERBORNE DISEASE OUTBREAKS, 1977, TAKEN FROM MORBIDITY AND MORTALITY WEEKLY REPORT

BACTERIAL

Clostridium botulinum

Botulism-Michigan 26(14):117
Follow-up on Botulism-Michigan 26(16);135
Type A Botulism Associated with Commercial Pot Pie-California 26(23):186

Clostridium perfringens

Clostridium perfringens Food Poisoning-California 27(19):164

Salmonella

Follow-up on *Salmonella bovis-morbificans*-Pennsylvania 26(3):14
Salmonellosis-Kentucky 26(29):239
Multistate Outbreak of *Salmonella newport* Transmitted by Precooked Roasts of Beef 26(34):277
Follow-up on Multistate Outbreak of *Salmonella newport* Transmitted by Precooked Roasts of Beef 26(35):286
Salmonellae in Precooked Beef 26(35):286
Follow-up on Salmonellae in Precooked Roasts of Beef 26(48):394

Staphylococcus

Staphylococcal Food Poisoning-Wisconsin 26(28):226
Presumed Staphylococcal Food Poisoning Associated with Whipped Butter 26(32):268

Vibrio cholerae

Vibrio cholerae-Hawaii 26(34):284
Imported Cholera-Guam 26(37):302

Vibrio parahaemolyticus

Gastroenteritis Caused by *Vibrio parahaemolyticus* Aboard a Cruise Ship 27(9):65

PARASITIC

Trichinella

Trichinosis from Shish Kebob-California 26(20):167

VIRAL

Hepatitis

Foodborne Outbreak of Hepatitis A-Pennsylvania 26(30):247

CHEMICAL

Copper

Outbreak of Acute Gastroenteritis Due to Copper Poisoning-Vermont 26(27):218

Herbal Tea

Pesticides

WATERBORNE DISEASE

☆U.S. GOVERNMENT PRINTING OFFICE: 1979- 640- 019 3610 REGION NO. 4

STATE EPIDEMIOLOGISTS AND STATE LABORATORY DIRECTORS

The State Epidemiologists are the key to all disease surveillance activities and their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors.

STATE	STATE EPIDEMIOLOGIST	STATE LABORATORY DIRECTOR
Alabama	Thomas J Chester, MD	James L Holston, Jr, DrPH
Alaska	Dean Tirador, MD	Frank P Pauls, DrPH
Arizona	Karen Starko, MD, Acting	Jon M Counts, DrPH
Arkansas	Paul C White, Jr, MD	Robert T Howell, DrPH
California	James Chin, MD	John M Heslep, PhD
Colorado	Stanley W Ferguson, PhD, Acting	C D McGuire, PhD
Connecticut	John N Lewis, MD	John J Redys, BS
Delaware	Ernest S Tierkel, VMD	Mahadeo P Verma, PhD
District of Columbia	Martin E Levy, MD	Alston Shields, DrPH
Florida	R Michael Yeller, MD, Acting	Nathan J Schneider, PhD
Georgia	John E McCroan, PhD	Earl E Long, MS
Guam	Robert L Haddock, DVM	
Hawaii	Ned H Wiebenga, MD	Albert I Oda
Idaho	Fritz R Dixon, MD	D W Brock, DrPH
Illinois	Byron J Francis, MD	Hugh-Bert Ehrhard, DrPH
Indiana	Richard D Telle, MD	Josephine Van Fleet, MD
Iowa	Laverne A Wintermeyer, MD	W J Hausler, Jr, PhD
Kansas	Donald E Wilcox, MD	Roger H Carlson, PhD
Kentucky	Calixto Hernandez, MD	B F Brown, MD
Louisiana	Charles T Caraway, DVM	Henry Bradford, PhD
Maine	Stefan H Zineski, MD, Acting	Howard E Lind, PhD
Maryland	David L Sorley, MD	J Mehsen Joseph, PhD
Massachusetts	Nicholas J Fiumara, MD	George F Grady, MD
Michigan	Norman S Hayner, MD	George R Anderson DVM
Minnesota	Andrew G Dean, MD	C Dwayne Morse, DrPH
Mississippi	Durward L Blakey, MD	R H Andrews, MS
Missouri	H Denny Donnell, Jr, MD	Elmer Spurrier, DrPH
Montana	Martin D Skinner, MD	Michael R Skeels, PhD
Nebraska	Paul A Stoesz, MD	Henry McConnell, DrPH
Nevada	William M Edwards, MD	Paul Fugazzotto, PhD
New Hampshire	Vladas Kaupas, MD	Robert A Miliner, DrPH
New Jersey	Ronald Altman, MD	John J Nelson
New Mexico	Jonathan A Mann, MD	Aaron Bond
New York State	Richard Rothenberg, MD	Robert Huffaker, Acting
New York City	John S Marr, MD	Bernard Davidow, PhD
North Carolina	Martin P Hines, DVM	Mildred A Kerbaugh
North Dakota	Kenneth Mosser	C Patton Steele, BS
Ohio	Thomas J Halpin, MD	Charles C Croft, ScD
Oklahoma	Mark A Roberts, MPH, Acting	William R Schmieding, PhD
Oregon	John A Googins, MD	William Murphey, PhD
Pacific Trust Territory	Masao Kumangai, MO	
Pennsylvania	William E Parkin, DVM	Vern Pidcoe, DrPH
Puerto Rico		Jose L Villamil
Rhode Island	Gerald A Faich, MD	Raymond G Lundgren, PhD
South Carolina	Richard L Parker, DVM	Arthur F DiSalvo, MD
South Dakota	James D Corning, BA	A Richard Melton, DrPH
Tennessee	Robert H Hutcheson, Jr, MD	Michael W. Kimberly, DrPH
Texas	Charles R Webb, Jr, MD	Charles Sweet, DrPH
Utah	Taira Fukushima, MD	Francis M Urry, PhD
Vermont	Richard L Vogt, MD	Dymitry Pomer, DVM
Virginia	Grayson B Miller, Jr, MD	Frank W Lambert, PhD
Virgin Islands	C Warren Smith, MD	
Washington	John W Taylor, MD	Jack Allard, PhD
West Virginia	John G Starr, MD	John W Brough, DrPH
Wisconsin	Jeffrey P Davis, MD	S L Inhorn, MD
Wyoming	Herman S Parish, MD	Donald T Lee, DrPH

7/17/79

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HEW
HEW 396

U.S. MAIL

HEW Publication No. (CDC) 79-8185