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DHEW Publication No. (CDC) 76-8185

## I. INTRODUCTION

The reporting of foodborne and waterborne diseases in the United States began about 50 years ago when state and territorial health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of enteric fever be investigated and reported. Their 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 gastro-intestinal 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 liquid vehicles into an annual summary. Since 1966, the quality of investigative reports has improved primarily as a result of more active participation by state and federal agencies in the investigation of foodborne and waterborne outbreaks. In this report, data from foodborne and waterborne disease outbreaks reported to CDC in 1974 are summarized.

Foodborne and waterborne disease surveillance has traditionally served 3 objectives:

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

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

not as yet been determined. The etiologic agent(s) responsible for the majority of waterborne outbreaks also awaits identification. In waterborne disease, as in foodborne disease, the roles of a variety of viral and bacterial agents, e.g. Yersinia enterocolitica, 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 outbreaks. Comprehensive surveillance should result in a clearer appreciation of priorities in food and water protection, institution of better training programs, and more rational planning.

## II. FOODBORNE DISEASE OUTBREAKS

### A. Definition of Outbreak

For the purpose of this report a foodborne disease outbreak is defined as an incident in which:

1. 2 or more persons experience a similar illness, usually gastrointestinal, after ingestion of a common food, and
2. epidemiologic analysis implicates the food as the source of the illness.

There are a few exceptions; 1 case of botulism or chemical poisoning constitutes an outbreak.

In this report outbreaks have been divided into 2 categories:

1. Laboratory confirmed--Outbreaks in which laboratory evidence of a specific etiologic agent is obtained and specified criteria are met (see Section H).
2. Undetermined etiology--Outbreaks in which epidemiologic evidence implicates a food source, but adequate laboratory confirmation is not obtained. These outbreaks are subdivided into 4 subgroups by incubation period of the illnesses--less than 1 hour (probable chemical, 1 to 7 hours (probable staph), 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 the 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 F) and send it to CDC.

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

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

## III. WATERBORNE DISEASE OUTBREAKS, 1974

This report summarizes data on waterborne disease outbreaks reported to CDC in 1974.

### A. Definition of Outbreak

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

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

### B. Sources of Data

Waterborne disease outbreaks are reported to CDC by state health departments. No standard reporting form is used but one has recently been devised and is presently being field tested in 8 states (see Section F). In addition, the Water Supply Research Laboratory, Environmental Protection Agency (EPA), contacts all state water supply agencies to obtain information about additional outbreaks. Personnel from CDC and EPA work together in the evaluation and investigation of waterborne disease outbreaks. When requested by a state health department, CDC and EPA can offer epidemiologic assistance and provide expertise in the engineering and environmental aspects of water purification. Data obtained on outbreaks are reviewed and summarized by representatives from CDC and EPA. A line listing of reported waterborne disease outbreaks in 1974 is included (see Section G).

In this report municipal systems are public or investor owned water supplies that may serve either large or small communities. Individual water systems, generally wells or springs, are used exclusively by single residences in areas that are without municipal systems. Semi-public water systems, also found in areas without municipal systems, are developed and maintained for use by several residences (e.g. subdivisions), industries, camps, parks, resorts, institutions, hotels, and other establishments at which the general public is likely to have access to drinking water.

### 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 disease, 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 1974 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 1974, 28 waterborne disease outbreaks (see Section G) involving 8,413 cases were reported to CDC (Table 1). The largest was an outbreak of giardiasis that occurred in Rome, New York. It was also the largest outbreak of giardiasis that has occurred in the United States; an estimated 4,800 persons had symptomatic giardiasis. The outbreak was also noteworthy because, for the first time, a *Giardia lamblia* cyst was demonstrated in water and, also for the first time, the water was shown to be infective for laboratory animals.

Table 1

Waterborne Disease Outbreaks,
1971--1974

| | 1971 | 1972 | 1973 | 1974 | Total |
|---|---|---|---|---|---|
| Outbreaks | 18 | 29 | 24 | 28 | 99 |
| Cases | 5,179 | 1,638 | 1,720 | 8,413 | 16,950 |

The second, third, and fourth largest outbreaks in 1974 also involved over 500 persons each. The second largest outbreak was in Richmond Heights, Florida; it involved about 1,200 cases of an acute gastrointestinal illness, some, if not all, of which were caused by Shigella sonnei. The third largest outbreak occurred in Big Sky, Montana, and involved 615 cases of acute gastrointestinal illness; the etiology was not definitely determined, but Yersinia enterocolitica was suspected when it was isolated from a well water sample. The fourth largest outbreak involved an estimated 600 persons at a camp at Lake Como, Pennsylvania, and was caused by Shigella sonnei.

There were no reported deaths associated with waterborne disease outbreaks in 1974.

Figure 1 shows the geographic distribution of outbreaks by state. Nineteen states reported at least 1 outbreak.

*Fig. 1* WATERBORNE OUTBREAKS, 1974


Figure 2 depicts the trend in reported waterborne disease outbreaks over the last 3 decades. During the last 3 years, there has been an increase in the annual average number of reported outbreaks. This increase probably represents in part a renewed interest in the reporting of disease outbreaks and in other surveillance activities.

*Fig. 2* AVERAGE ANNUAL NUMBER WATERBORNE DISEASE OUTBREAKS, 1938-1974

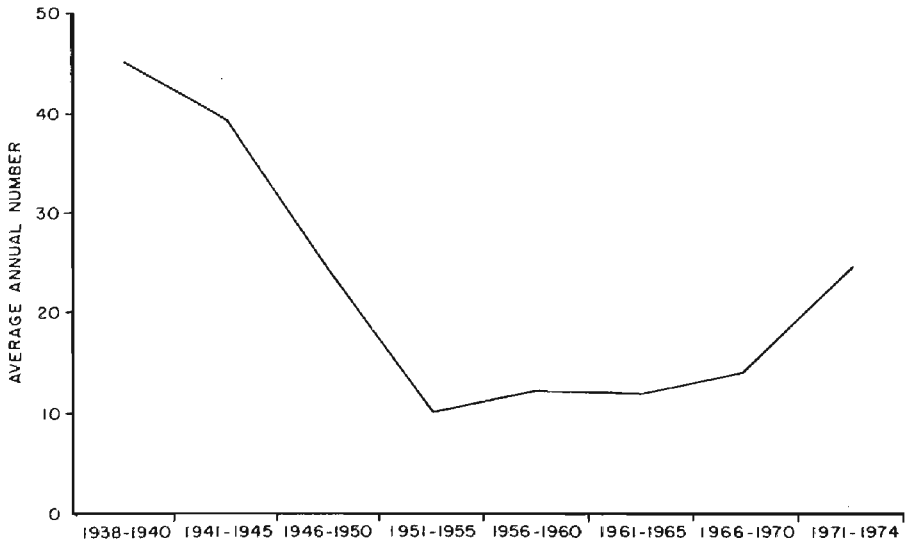



Table 2 shows the number of outbreaks and cases by etiology and type of water system. The category with the most outbreaks is designated "Acute gastrointestinal illness." This category includes outbreaks characterized by upper and/or lower gastrointestinal symptomatology for which no specific etiologic agent was identified. In previous years, these outbreaks were grouped under the category "sewage poisoning." Of the illnesses of known etiology, giardiasis was responsible for most of the outbreaks and cases.

Table 2

Waterborne Disease Outbreaks, by Etiology and Type of Water System, 1974

| | MUNICIPAL | | SEMI-PUBLIC | | INDIVIDUAL | | TOTAL | |
|---|---|---|---|---|---|---|---|---|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| Acute gastro-intestinal illness | 4 | 440 | 5 | 847 | 2 | 25 | 11 | 1,312 |
| Chemical poisoning | 3 | 39 | 1 | 213 | 1 | 17 | 5 | 269 |
| Giardiasis | 4 | 4,930 | 1 | 18 | 2 | 39 | 7 | 4,987 |
| Shigellosis | 1 | 1,200 | 2 | 606 | - | - | 3 | 1,806 |
| Salmonellosis (non-typhoid) | - | - | 1 | 34 | - | - | 1 | 34 |
| Typhoid | - | - | - | - | 1 | 5 | 1 | 5 |
| Total | 12 | 6,609 | 10 | 1,718 | 6 | 86 | 28 | 8,413 |

Most outbreaks involved municipal (43%) and semi-public (36%) water systems and fewer involved individual water systems (21%). Outbreaks attributed to water from municipal systems affected an average of 551 (6609/12) persons compared with 172 (1718/10) persons in outbreaks attributed to water from semi-public systems, and 14 (86/6) persons in outbreaks attributed to water from individual systems. Of the 10 outbreaks associated with semi-public water supplies, 8 (80%) involved visitors to areas used mostly for recreational purposes, and 4 of the 8 occurred in July and August (Table 3).

Table 3

Waterborne Disease Outbreaks Involving Semi-Public Water Supplies, by Month and Population Affected, 1974

| Month | Number of Outbreaks | Usual Population* | Visitors** |
|---|---|---|---|
| January | 1 | | 1 |
| February | | | |
| March | | | |
| April | 1 | | 1 |
| May | | | |
| June | 1 | 1 | |
| July | 3 | 1 | 2 |
| August | 2 | | 2 |
| September | | | |
| October | 1 | | 1 |
| November | | | |
| December | 1 | | 1 |
| Total | 10 | 2 | 8 |

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

The distribution of all outbreaks by month is shown in Table 4. As in the past, outbreaks tended to occur during the summer months; 18(64%) of the outbreaks began in June, July, August, and September.

Table 4

Waterborne Disease Outbreaks, by Month of Occurrence, 1974

| Month | Number of Outbreaks | Month | Number of Outbreaks |
|---|---|---|---|
| January | 2 | July | 4 |
| February | 1 | August | 6 |
| March | 1 | September | 4 |
| April | 1 | October | 1 |
| May | 0 | November | 2 |
| June | 4 | December | 2 |
| | Total | 28 | |

In Table 5, outbreaks and cases are classified by type of water system and the system deficiency responsible for the outbreak. In all the outbreaks which involved more than 20 persons, the cause of the system deficiency was untreated or inadequately treated water, i.e., 1 of the first 3 types of deficiencies listed in Table 5. These 3 types of deficiencies accounted for 99% of the total cases.

Table 5

Waterborne Disease Outbreaks, by Type of System and Cause of System Deficiency, 1974

| | MUNICIPAL | | SEMI-PUBLIC | | INDIVIDUAL | | TOTAL | |
|---|---|---|---|---|---|---|---|---|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| Untreated surface water* | 4 | 4,930 | 1 | 18 | 3 | 59 | 8 | 5,007 |
| Untreated ground water | - | - | 4 | 1,290 | 1 | 5 | 5 | 1,295 |
| Treatment deficiencies** | 3 | 1,609 | 4 | 404 | - | - | 7 | 2,013 |
| Deficiencies in distribution system | 4 | 58 | - | - | - | - | 4 | 58 |
| Miscellaneous*** | 1 | 12 | 1 | 6 | 2 | 22 | 4 | 40 |
| TOTAL | 12 | 6,609 | 10 | 1,718 | 6 | 86 | 28 | 8,413 |

*Includes 3 municipal outbreaks of giardiasis in which surface water was treated with chlorination but not filtered.
**Includes outbreaks in systems using a known contaminated source for which chlorination is required at all times to ensure potability.
***Includes 1 outbreak of shigellosis (Ohio) in which illness was associated with drinking from a water fountain, 1 outbreak of acute gastrointestinal illness (Pennsylvania) traced to ice cubes from a commercial ice vending machine, 1 outbreak of giardiasis (Tennessee) in which the water source was on underground cistern, and 1 outbreak of phenol poisoning (Wisconsin) in which the water was obtained from accidentally contaminated wells.

E. Waterborne Outbreaks on Cruise Ships or Abroad

Waterborne outbreaks involving passengers on cruise ships or travelers to foreign countries, and outbreaks associated with water that is not used for drinking are not included in this report's tabulations. Nevertheless, they represent important aspects of waterborne disease and those outbreaks involving the traveling public constitute a continuing public health problem. The following reports of 3 such outbreaks are taken verbatim from Morbidity and Mortality Weekly Report.

Salmonellosis on a Caribbean Cruise Ship
(MMWR 23(39):333, 1974)

On August 13, 1974, representatives of the Royal Caribbean Cruise Line reported to CDC's Miami Quarantine Station the occurrence of 118 cases of gastrointestinal illness in passengers and crew aboard the M/S Sun Viking which sailed from Miami at 5:30 p.m. on August 3 on a 2-week Caribbean cruise. Two passengers had been hospitalized in San Juan, Puerto Rico, the first port-of-call, on August 6. Stool cultures obtained in San Juan from these 2 individuals and from a pastry man aboard

the ship who had also experienced diarrhea had grown salmonella group D organisms. Two of these 3 isolates were later sent to CDC and identified as Salmonella enteritidis.

A questionnaire survey of passengers and crew was conducted on August 15 and 16, at which time there were 787 passengers and 319 crew members aboard. Questionnaires were returned by 751 (95%) passengers and 298 crew members (93%). A case of gastrointestinal illness in passengers was defined as the occurrence of loose or watery bowel movements alone, abdominal cramps and 1 other gastrointestinal symptom, or abdominal cramps and either fever or headache. Because the investigators and some crew members could not communicate in any common language, a case of illness in a crew member was defined simply as the occurrence of diarrhea.

Of the 695 passengers who embarked in Miami and returned questionnaires, 274 (39%) became ill. In contrast, only 3 of the 54 passengers (6%) who boarded the ship in Venezuela on August 12 had any gastrointestinal illness. The difference was significant ($X^2 = 23.23$, $p < .001$). Forty-one of 298 crew members (14%) had diarrhea between August 3 and 15. The attack rate for crew was significantly lower than for passengers ($X^2 = 52.74$, $p < .001$). Ten passengers were hospitalized aboard ship; 9 of them were treated with intravenous fluids, and none received antibiotics. Two of these 10 passengers were subsequently hospitalized ashore. No deaths occurred.

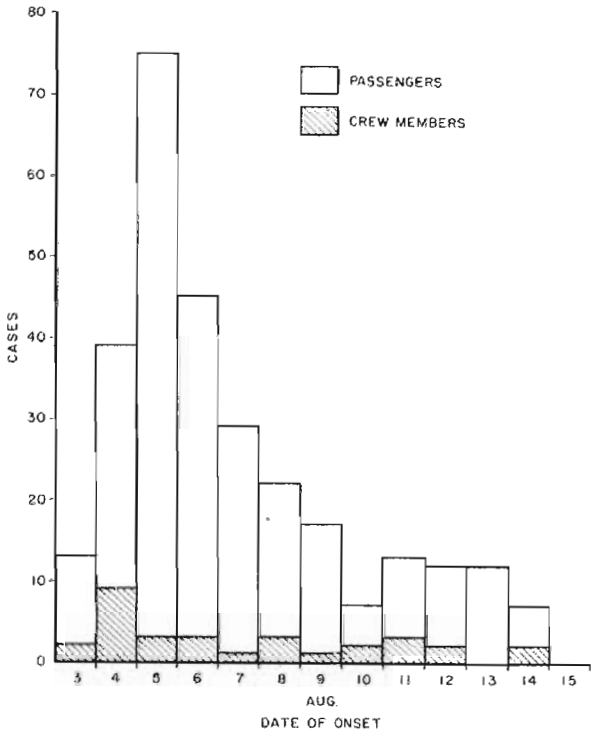
Symptoms most frequently reported by ill passengers were diarrhea, abdominal cramps, and headache (Table 6). Fever (temperature > 100°F) was documented in 18 of the 23 passengers on whom temperatures were recorded. The median duration of illness in passengers was 4 days. The epidemic curve, shown in Figure 3, is compatible with an explosive common-source outbreak which occurred prior to arrival at the first port-of-call, San Juan, on August 6.

Table 6

Symptoms of Passengers with Gastrointestinal Illness

| Symptom | Number Responding | Respondents with Symptom | |
|---|---|---|---|
| | | Number | Percent |
| Diarrhea | 274 | 256 | 93 |
| Abdominal cramps | 271 | 206 | 76 |
| Headache | 273 | 171 | 63 |
| Chills | 273 | 143 | 52 |
| Nausea | 271 | 142 | 52 |
| Fever | 264 | 126 | 48 |
| Vomiting | 272 | 71 | 26 |
| Tenesmus | 271 | 46 | 17 |
| Blood in stool | 273 | 14 | 5 |

*Fig. 3* GASTROINTESTINAL ILLNESS BY DATE OF ONSET, M/S SUN VIKING, AUGUST 3-15, 1974




S. enteritidis was isolated from rectal cultures obtained from 50 of 71 ill passengers (70%) and 23 of 42 non-ill passengers (55%) who boarded the ship in Miami. Rectal cultures from 6 of 22 ill (27%) and 6 of 47 (13%) non-ill crew members were also positive for S. enteritidis. Foodhandlers were no more likely to have positive cultures than other crew members. In addition, Salmonella javiana was isolated from 1 passenger and 1 crew member, and Salmonella eimsbuettel was isolated from 1 crew member. Eighty-three environmental swabs and 23 food specimens were negative for salmonella organisms.

Epidemiologic investigation revealed that passenger cases did not cluster in any part of the ship. Eating at the midnight buffet on either the first or second night of the cruise was not associated with illness. Because adequate food consumption histories could not be obtained on the ship's return to Miami, a random sample of ill culture-positive passengers and 18 of 19 culture-negative passengers who did not experience gastrointestinal illness during the cruise were interviewed by telephone after the cruise to determine the risk of illness associated with eating certain foods served during the first 2 days of the cruise. None of the food items could be significantly statistically associated with illness.

Attack rates did not differ significantly between crew members who ate food from the passenger galley and those who ate food prepared in the crew galley. An inspection of the passenger and crew galleys revealed in general an adequate sanitary environment. However, several refrigerators had elevated temperatures of 48-58°F. Some counter tops, mixing utensils, and knives were not clean. In addition, raw chicken was stored in a refrigerator that also held cooked meats.

Attack rates could not be significantly statistically correlated with the amount of water or of beverages containing ice consumed by passengers or crew during the cruise.

Potable water is disinfected aboard the ship by ultraviolet light. In addition, prior to and at the time of the outbreak, water in the potable-water tanks was routinely batch chlorinated each week; batch chlorination was performed during the cruise on August 7 and 14. Water cultures from "raw" (not yet treated on board) and potable-water tanks and the distribution system revealed no coliform contamination. However, 1 of 5 water samples obtained from the potable-water distribution system on August 16 grew S. enteritidis. The positive sample was obtained from the water tap in the sink in the chief engineer's bathroom, which was located at the furthest peripheral point in the potable water distribution system. The steward responsible for cleaning the cabin had experienced diarrhea, which began on August 4 and lasted 3 days. A rectal culture obtained from this steward on August 16 yielded S. enteritidis. Subsequent investigation revealed no evidence of cross-connections between the potable water and sewage systems.

Control measures consisted of disinfecting the galleys and all raw and potable water tanks, initiating the practice of batch chlorinating the raw water

tanks at the time of bunkering and monitoring the free residual chlorine in the potable water distribution system daily. In addition, elevated refrigerator temperatures were lowered to the recommended 45°F, and company personnel were advised to store raw and cooked meats in separate refrigerators. Culture-positive foodhandlers were removed from duty until 3 consecutive negative cultures were obtained.

On 2 subsequent 2-week cruises, 4 and 1 cases of diarrhea, respectively, were reported in passengers and crew. This incidence is well within expected rates for 2-week Caribbean cruises (1).

(Reported by the Epidemiologic Services Laboratory Branch and the Enteric Diseases Branch, Bacterial Diseases Division, and the Quarantine Division, Bureau of Epidemiology, CDC; and 2 EIS Officers.)

Editorial Note

The explosive common-source outbreak occurred aboard ship before it arrived at the first port-of-call. Epidemiologic investigation failed to clearly implicate either food or water. The isolation of S. enteritidis from a single rectal swab taken from 55% of 42 non-ill passengers cultured 11 days after the peak of the outbreak suggests that the majority of non-ill passengers may have also been exposed to a contaminated vehicle. The significance of the single isolation of S. enteritidis from water is unclear.

Reference

1. Survey of the incidence of gastrointestinal illness in cruise ship passengers. Morbidity and Mortality Weekly Rep 23:65-66, 16 Feb 1974

## Giardia Lamblia Infection in Travelers to the Soviet Union
(MMWR 23(9):78, 1974)

In July 1973, CDC was notified of 3 cases of Giardia lamblia infection in nurses who had recently returned from a tour of the Soviet Union. Subsequent investigation revealed that the nurses were members of 1 of 3 professional seminar tours sponsored by the American Association of Nurse-Anesthetists. The first 2 tour groups departed on May 6, 1973, and returned on May 15, while the third group traveled between May 13 and 23. Between September and December 1973, information was sought on the 399 tour participants concerning their age, sex, occupation, illness, symptoms, duration of illness, hotel lodging, food and water exposure, and health precautions. Nearly 80% of them (318) responded. Stool specimens were obtained from 136 (43%) of those who provided information. The group ranged in age from 18 to 76, and 282 were females. Illness during the tour or shortly after return from the Soviet Union was reported by 113 (36%) persons.

An individual was considered to have giardiasis if he had either 1) a positive stool examination or 2) a diarrheal illness lasting 1 week or longer. Using this definition, 70 (22%) of the 318 persons completing the questionnaire were diagnosed as having giardiasis. Of the 70 cases, 30 had positive stool examinations, and 18 did not submit a specimen. There was no difference in symptoms, duration of illness, and incubation period between ill cases diagnosed by positive stool examination and those diagnosed clinically. Eight individuals who had positive stools were asymptomatic. Diarrhea was the most common symptom followed by cramps, nausea, and weakness (Table 1). Fever occurred in only 10 cases. The mean duration of illness was 6.5 weeks (range--1 to 30 weeks), and the mean time period until the onset of illness since entering the Soviet Union was 14.7 days (range--1 to 43 days).

All members of the tour group visited both Moscow and Leningrad. Infection with G. lamblia was not related to ingestion of uncooked vegetables or ice cream or eating at a specific restaurant. However, a history of drinking tap water was more common among cases than non-cases. Only 2 of the 69 cases from whom information was obtained gave a history of not drinking tap water compared with 33 of 243 non-cases ($X^2 = 5.13$, $p > 0.05$).

(Reported by Mark Kaplan, M.D., Carol Singer, M.D., Infectious Disease Fellows, and Donald Armstrong, M.D., Chief, Infectious Disease Service, James Ewing Memorial Hospital, New York City; Pascal J. Imperato, M.D., Director, Bureau of Infectious Disease Control, New York City Department of Health; and the Parasitic Diseases and Veterinary Public Health Division, Bureau of Epidemiology, CDC.)

Editorial Note

This outbreak of G. lamblia infection among participants in tours to the Soviet Union is representative of other epidemics of giardiasis in travelers to the USSR reported to CDC since 1969. The first reports of epidemic giardiasis among travelers to the Soviet Union appeared in 1970 (1,2). Since then, reported outbreaks have occurred in American (3) and Swedish travelers (4,5).

G. lamblia is a flagellated protozoan of the small intestine. Clinical manifestations of Giardia infection can range from asymptomatic cyst passage to severe malabsorption syndrome. Illness usually begins toward the end of the trip or shortly after return home, and the mean duration of illness is 2-3 months. Prominent symptoms include diarrhea (often greasy and malodorous), abdominal cramps, fatigue, weight loss, flatulence, anorexia, and nausea. Treatment with metronidazole or quinacrine is highly effective in both symptomatic and asymptomatic infections.

Between 1969 and 1973, CDC received information on 1,419 persons who were members of 47 tour groups that had traveled to various cities in the Soviet Union. Among these persons, a case was defined as a person with a positive stool examination for G. lamblia or diarrhea lasting more than 1 week. There was no difference in symptoms, duration of illness, and incubation period between ill persons diagnosed by positive stool examination and those diagnosed clinically. An attack rate of 23% was found among these groups. Epidemiologic evidence implicated Leningrad as the site of infection ($X^2 = 51.14$, $p < 0.001$) and tap water as the probable vehicle of transmission ($X^2 = 7.13$, $p < 0.01$). Many patients after their return to the United States underwent unnecessary laboratory tests and suffered long delays before the diagnosis was made since many physicians did not include Giardia infection in their differential diagnosis of traveler's diarrhea.

Giardiasis should be considered in any person with a diarrheal illness lasting 1 week or longer who has recently traveled outside the United States. There is no known chemoprophylaxis for giardiasis. Although the ingestion of ice cream, unpeeled fruit, and inadequately cooked food are often associated with diarrheal disease in travelers, they were not associated with an increased risk of giardiasis in the studies reported here. Measures such as avoiding ingestion of tap water and of uncooked, unpeeled fruits and vegetables may be effective, although infection has been documented in persons who followed these precautions.

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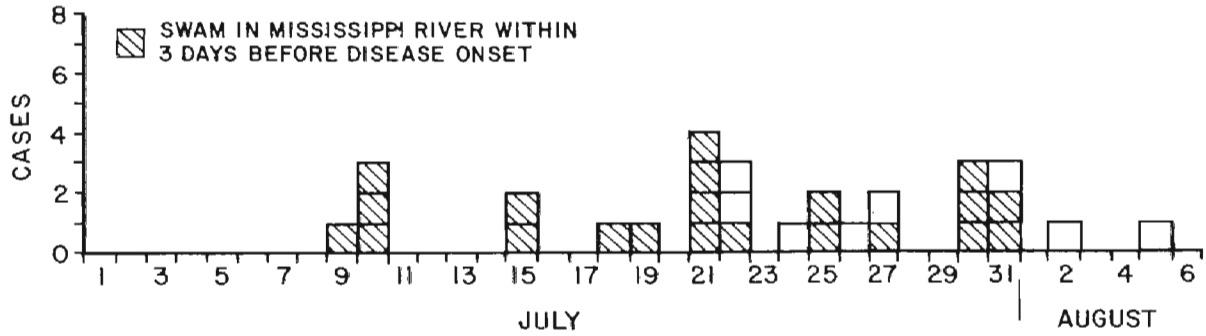
## Shigellosis Associated with Swimming in the Mississippi River--Iowa
(MMWR 23(46):398, 1974)

Thirty-nine culture-positive cases of shigellosis occurring in 29 families between July 9 and August 5, 1974, were reported to the City and County Health Departments, Dubuque, Iowa, by August 30. Symptoms included diarrhea (100%),

accompanied by fever (95%), abdominal pain (79%), chills (51%), headache (51%), vomiting (49%), and blood in stools (23%). Thirty-seven persons (95%) consulted a physician, 16 (41%) were hospitalized, and 1 underwent surgery for acute appendicitis. All isolates were Shigella sonnei.

Investigation revealed that 21 (72%) of the initial cases in each family had swum in a 5-mile portion of the Mississippi River about 6-11 miles south of Dubuque within 3 days before disease onset; 10 of these 21 persons swam at the same spot, a small beach near a camping park 10 miles south of Dubuque. The median age of all swimmers was 5 years and of the other initial cases, 12.5 years. Only 2 cases, both swimmers, had shared food or had personal contact; only 2 of the 10 swimmers from the park beach had consumed food or water while there. Swimming exposures and disease onsets for the 29 initial cases occurred over a 28-day period (Figure 4). Comparison of these cases with a neighbor-matched control group showed a statistically significant correlation ($p<.0000001$) between swimming and illness.

*Fig. 4* 29 INITIAL SHIGELLOSIS CASES BY DATE OF ONSET, DUBUQUE, IOWA, JULY 9 - AUGUST 5, 1974




A retrospective telephone survey of 60 family groups who had camped at the park showed a statistically significant association between diarrheal illness and swimming at the beach near the park ($p<.0001$) but no association with drinking water from the well or consuming food prepared at a park restaurant. The attack rate among all swimmers was 13%; among those swimmers who remembered getting river water in their mouths it was 21%. The attack rate for swimmers less than 20 years old (16%) was more than twice that for swimmers over 20 (6%).

S. sonnei isolates from the 21 swimmers were examined for antibiogram and colicin type. Isolates from 6 were resistant to tetracycline, streptomycin, carbenicillin, and ampicillin, sensitive to 8 other antibiotics tested, and colicin untypable. Isolates from 12 were resistant to tetracycline, streptomycin, and sulfathiazole and were colicin type 9. Isolates from 2 were resistant only to sulfathiazole and were colicin type 9. The antibiogram and colicin type of the isolate from 1 swimmer were unknown.

Water samples were obtained from a 5-mile stretch of river between the Dubuque sewage treatment plant and the swimming area on August 2, 5, 7, 13, and 20. Mean fecal coliform counts were 17,500 organisms per 100 ml in the swimming area near the park and 6,500 organisms per 100 ml 5 miles upstream just below the outfall of the Dubuque sewage treatment plant. S. sonnei, with the same antibiogram and colicin type as the isolates from 6 cases (resistant to tetracycline, streptomycin, carbenicillin, and ampicillin, colicin untypable), was isolated at the Mercy Medical Center Laboratory in Dubuque from a sample of water obtained at the swimming area on September 4. Several possible sources of river contamination were found, but the specific source of shigella contamination could not be identified.

A ban was posted on swimming and waterskiing in the involved area on August 2, and no cases directly attributable to river contact in that area occurred after the ban was announced. Investigations were initiated to further identify and correct sources of river contamination.

(Reported by John Schaefer, and Ray Ann Moriarity, Bacteriology Laboratories, Mercy

Medical Center; Mary Gleason Kline, Frances Kringle, Glenann Slade, Mary Jane Toner, Mary Unsen, Public Health Nurses, and Arthur J. Roth, Jr., M.P.H., City Health Administrator, Dubuque City Health Department; David Kunkel, Sanitarian, and Isabel Hagge, Public Health Nurse, Dubuque County Health Department; Kenneth K. Hazlet, M.D., Director, Dubuque City and County Health Departments; Kim Deppe, Public Health Nurse, Jackson County Health Department; Franklin P. Koontz, Ph.D., Assistant Director, William J. Hausler, Ph.D., Director, Iowa State Hygienic Laboratories; Kenneth Choquette, Director, Health Engineering Section, William Permar, Robert Olsen, Frank Thompson, and Charles A. Herron, M.D., State Epidemiologist, Iowa State Department of Health; and an EIS Officer.)

Editorial Note

Epidemiologic data strongly implicated swimming in the Mississippi River as the vehicle of transmission of shigellosis for 21 of the 29 initial cases in this study. Other infectious diseases associated with swimming in polluted natural waters include hepatitis (MMWR, Vol. 20, No. 26), typhoid fever (1), dermatitis (MMWR, Vol. 18, No. 41), primary amebic meningoencephalitis (MMWR, Vol. 20, No. 24), and leptospirosis (2). An outbreak of shigellosis in 1969 in Medford, Oregon, was traced to 8 index patients, 2 to 6 years old, who had used a wading pool grossly contaminated with fecal coliforms (MMWR, Vol. 18, No. 46); however, shigellae were not cultured from the pool, and epidemiologic data could not further implicate the pool as the source.

In this outbreak, fecal coliform counts where the children swam greatly exceeded the recommended federal standards of 200 per 100 ml of water used for swimming and other recreational purposes (3). The small number of swallowed shigellae necessary to cause disease ($10^1$-$10^2$ shigella organisms, compared to $10^5$ salmonellae or $10^8$ *Vibrio cholerae*) suggest that this organism may pose a significant risk to swimmers in polluted waters (4).

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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

**Pretest**

**1. Where did the outbreak occur?**

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

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

_____ (3-8)

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

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

**4. History of exposed persons:**

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

**5. Incubation period (hours):**

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

**6. Duration of illness (hours):**

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

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

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

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

**9. Water supply characteristics**

**(A) Type of water supply**** (61)

- ☐ Municipal or community supply (Name _____)
- ☐ Individual household supply
- ☐ Semi-public water supply
  - ☐ Institution, school, church
  - ☐ Camp, recreational area
  - ☐ Other, _____
- ☐ Bottled water

**(B) Water source** *(check all applicable)*: (62-65)

- ☐ Well
- ☐ Spring
- ☐ Lake, pond
- ☐ River, stream

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

| | | | | |
|---|---|---|---|---|
| a | b | c | d | a. no treatment |
| a | b | c | d | b. disinfection only |
| a | b | c | d | c. purification plant – coagulation, settling, filtration, disinfection *(circle those applicable)* |
| a | b | c | d | d. other _____ |

**10. Point where contamination occurred:** (66)

☐ Raw water source ☐ Treatment plant ☐ Distribution system

*See HSM 4.245 (NCDC) Investigation of a Foodborne Outbreak, Item 7.

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

CDC 4.461
2-75

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

| ITEM | ORIGINAL | CHECK UP | DATE | FINDINGS | | BACTERIOLOGIC TECHNIQUE (e.g., fermentation tube, mer. brane 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. | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
| | | | | | | |

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

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

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

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

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

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

**16. Etiology:** (69-70)

Pathogen _____
Chemical _____
Other _____

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

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

**Name of reporting agency:** (72)

**Investigating Official:**

**Date of investigation:**

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

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

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

CDC 4.461 (Back)
2-75

## G. LINE LISTING OF WATERBORNE DISEASE OUTBREAKS

G. Line Listing of Waterborne Disease Outbreaks, 1974

| State | Month | Disease | Cases | Type of System | System Deficiency* |
|---|---|---|---|---|---|
| Alaska | July | *Salmonella typhimurium* gastroenteritis | 34 | Semi-public | 3 |
| California | September | Acute gastrointestinal illness | 18 | Individual | 1 |
| Colorado | August | Acute gastrointestinal illness | 85 | Semi-public | 3 |
| Colorado | June-July | Giardiasis | 18 | Semi-public | 1** |
| Florida | January-March | *Shigella sonnei* gastro-enteritis*** | 1,200 | Municipal | 3 |
| Idaho | March | Acute gastrointestinal illness | 9 | Municipal | 3 |
| Illinois | September | Furadan insecticide poisoning | 1 | Municipal | 4 |
| Montana | December 1974-January 1975 | Acute gastrointestinal illness | 615 | Semi-public | 2 |
| New Hampshire | June-August | Giardiasis | 78 | Municipal | 1** |
| New Hampshire | August | Acute gastrointestinal illness | 7 | Individual | 1 |
| New Jersey | January-February | Acute gastrointestinal illness | 57 | Semi-public | 2 |
| New York | September | Acute chromate poisoning | 20 | Municipal | 4 |
| New York | November 1974-June-1975 | Giardiasis | 4,800 | Municipal | 1** |
| North Carolina | April | Acute fluoride poisoning | 213 | Semi-public | 3 |

| | | | | | |
|---|---|---|---|---|---|
| Ohio | July | Shigella gastroenteritis | 6 | Semi-public | 5 |
| Oregon | February | Cutting oil poisoning | 18 | Municipal | 4 |
| Oregon | August | Acute gastrointestinal illness | 19 | Municipal | 4 |
| Oregon | August | Acute gastrointestinal illness | 400 | Municipal | 3 |
| Pennsylvania | June | Acute gastrointestinal illness | 12 | Municipal (Ice vending machine) | 5 |
| Pennsylvania | July | Acute gastrointestinal illness | 72 | Semi-public | 3 |
| Pennsylvania | August | *Shigella sonnei* gastro-enteritis | 600 | Semi-public | 2 |
| Pennsylvania | October | Acute gastrointestinal illness | 18 | Semi-public | 2 |
| Tennessee | August 1973**** | Giardiasis | 5 | Individual | 5 |
| Utah | September | Giardiasis | 34 | Individual | 1 |
| Vermont | November 1974-April 1975 | Giardiasis | 32 | Municipal | 1** |
| Vermont | December 1973**** April 1974 | Giardiasis | 20 | Municipal | 1** |
| Washington | June | Typhoid fever | 5 | Individual | 2 |
| Wisconsin | July | Phenol poisoning | 17 | Individual (Multiple) | 5 |

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

**Surface water treated only with chlorination

***Only 10 cases culture-proven but clinical signs and symptoms of others compatible with shigellosis

****Outbreak began in 1973 but reported in 1974

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## V. ARTICLES ON FOODBORNE AND WATERBORNE DISEASE OUTBREAKS, 1974, TAKEN FROM MORBIDITY AND MORTALITY WEEKLY REPORT

### BACTERIAL

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*Botulism--United States, 1974 24(5):39
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*Possible waterborne shigellosis--Pennsylvania 24(38):324

*Outbreak occurred in 1974; reported in MMWR in 1975