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 1980, 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 1975 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 enterocolitica, 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 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 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 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-
   ness--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 responsibili-

ty 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 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 botulinum 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, 1975

This report summarizes data on waterborne disease outbreaks reported to CDC in 1975.

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

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

B. Sources of Data
Waterborne disease outbreaks are reported to CDC by state health departments. No standard reporting form is used but one has recently been devised and is presently being field tested in 8 states (see Section E). 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 1975 is included (see Section F).

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 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 1975 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 1975, 24 waterborne disease outbreaks involving 10,879 cases were reported to CDC (Table 1). No etiologic agent was found for the 2 largest outbreaks: 1 in Sewickley, Pennsylvania, and 1 in Sellersburg, Indiana. The third largest outbreak, involving over 1,000 persons, occurred at Crater Lake National Park, Oregon. Toxigenic Escherichia coli, serotype 06:H16, was isolated from ill park residents and from the park’s water supply.

Table 1
Waterborne Disease Outbreaks, 1972-1975

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbreaks</td>
<td>27</td>
<td>24</td>
<td>28</td>
<td>24</td>
<td>105</td>
</tr>
<tr>
<td>Cases</td>
<td>1,638</td>
<td>1,720</td>
<td>8,413</td>
<td>10,879</td>
<td>22,550</td>
</tr>
</tbody>
</table>
Figure 1 shows the geographic distributions of outbreaks by state. Fourteen states and Puerto Rico reported at least 1 outbreak.

Figure 2 depicts the trend in reported waterborne disease outbreaks over the last 3 decades. Although the number of outbreaks reported in 1975 was less than in 1974, the number of cases has continued to increase (Table 1).

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." The 3 chemical outbreaks were due to fuel oil, herbicide, and ethyl acrylate. One outbreak each was caused by G. lamblia, S. schmele, enterotoxigenic E. coli, and hepatitis A. There were no reported deaths associated with waterborne disease outbreaks in 1975.

Most outbreaks involved semi-public (67%) and municipal (25%) water systems, and fewer involved individual (8%) systems. Outbreaks attributed to water from municipal systems affected an average of 1,218 persons compared with 221 persons in outbreaks involving semi-public systems and 13 persons in outbreaks associated with individual water systems. Of the 16 outbreaks associated with semi-public water supplies, 11 (69%) involved visitors to areas used mostly for recreational purposes.

![Figure 1: Waterborne Outbreaks, 1975](image)

### Table 2

<table>
<thead>
<tr>
<th></th>
<th>MUNICIPAL</th>
<th>SEMI-PUBLIC</th>
<th>INDIVIDUAL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outbreaks</td>
<td>Cases</td>
<td>Outbreaks</td>
<td>Cases</td>
</tr>
<tr>
<td>Acute gastrointestinal illness</td>
<td>4</td>
<td>7,300</td>
<td>13</td>
<td>2,450</td>
</tr>
<tr>
<td>Chemical poisoning</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>Giardiasis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>56</td>
</tr>
<tr>
<td>Enterotoxigenic E. coli</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1,000</td>
</tr>
<tr>
<td>Hepatitis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>7,311</td>
<td>16</td>
<td>3,542</td>
</tr>
</tbody>
</table>

TOTAL: 24 outbreaks, 10,879 cases.
Fig. 2  AVERAGE ANNUAL NUMBER WATERBORNE DISEASE OUTBREAKS, 1938-1975

In Table 3, outbreaks and cases are classified by type of water system and the system deficiency responsible for the outbreak. Treatment deficiencies were responsible for the most outbreaks, however, deficiencies in the distribution systems of municipal water supplies were responsible for the highest number of cases.

Table 3

Waterborne Disease Outbreaks, by Type of System, and Cause of System Deficiency, 1975

<table>
<thead>
<tr>
<th></th>
<th>MUNICIPAL</th>
<th>SEMI-PUBLIC</th>
<th>INDIVIDUAL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outbreaks</td>
<td>Cases</td>
<td>Outbreaks</td>
<td>Cases</td>
</tr>
<tr>
<td>Untreated surface water</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Untreated ground water</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>774</td>
</tr>
<tr>
<td>Treatment deficiencies</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>2,695</td>
</tr>
<tr>
<td>Deficiencies in distribution system</td>
<td>5</td>
<td>6,961</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1</td>
<td>350</td>
<td>2</td>
<td>66</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>7,311</td>
<td>16</td>
<td>3,542</td>
</tr>
</tbody>
</table>
The distribution of all outbreaks by month is shown in Table 4. As in the past, outbreaks tended to occur in the spring and summer; 17 (71%) of the outbreaks began in May, June, July, August, and September. All 11 outbreaks in recreational areas occurred in the spring and summer months, May to September (Table 5).

Table 4
Waterborne Disease Outbreaks, by Month of Occurrence, 1975

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Outbreaks</th>
<th>Month</th>
<th>Number of Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
<td>July</td>
<td>3</td>
</tr>
<tr>
<td>February</td>
<td>1</td>
<td>August</td>
<td>4</td>
</tr>
<tr>
<td>March</td>
<td>1</td>
<td>September</td>
<td>2</td>
</tr>
<tr>
<td>April</td>
<td>2</td>
<td>October</td>
<td>2</td>
</tr>
<tr>
<td>May</td>
<td>2</td>
<td>November</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>6</td>
<td>December</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5
Waterborne Disease Outbreaks Involving Semi-Public Water Supplies, by Month and Population Affected, 1975

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Outbreaks</th>
<th>Usual Population#</th>
<th>Visitors##</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>February</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>March</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>April</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>May</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>June</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>July</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>August</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>September</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>October</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>November</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>December</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>16</strong></td>
<td><strong>5</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

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

In addition to outbreaks due to consumption of water, 2 outbreaks of leptospirosis were attributed to swimming in contaminated surface water. Seven children in Tennessee developed infection with *Leptospira interrogans* serotype *grippotyphosa* after swimming in a small local stream. Two persons in Louisiana became infected with leptospires of the serotype *icterohaemorrhagiae* after bathing in a man-made lake.
E. INVESTIGATION OF A WATERBORNE OUTBREAK.

1. Where did the outbreak occur?
   - State: ____________________________ (1-2)  
   - City or Town: ________________________  
   - County: ____________________________ (3-4)

2. Date of outbreak: (Date of onset of 1st case)
   - Shortest: ____________________________ (4-6)
   - Median: ____________________________ (4-6)
   - Longest: ____________________________ (4-6)

3. Indicate actual or estimated (a) numbers:
   - Persons exposed: ________________________ (9-11)
   - Persons ill: ____________________________ (12-14)
   - Hospitalized: ___________________________ (15-16)
   - Fatal cases: ____________________________ (17)
   - No histories obtained: ____________________ (18-20)
   - No persons with symptoms: ________________ (21-23)
   - Nausea: (24-26)
   - Diarrhea: (27-29)
   - Vomiting: (30-32)
   - Fever: (33-35)
   - Cramps: (36-38)

4. History of exposed persons:
   - Other, specify: _________________________ (39)

5. Incubation period (hours):
   - Shortest: ____________________________ (40-42)
   - Median: ____________________________ (43-45)
   - Longest: ____________________________ (46-48)

6. Duration of illness (hours):
   - Shortest: ____________________________ (50-51)
   - Median: ____________________________ (52-54)
   - Longest: ____________________________ (55-57)

7. Epidemiologic data (e.g., attack rate [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) * (38)

<table>
<thead>
<tr>
<th>ITEMS SERVED</th>
<th>NUMBER OF PERSONS WHO ATE OR DRANK SPECIFIED FOOD OR WATER</th>
<th>NUMBER WHO DID NOT EAT OR DRINK SPECIFIED FOOD OR WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ILL</td>
<td>NOT ILL</td>
</tr>
</tbody>
</table>

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

9. Water supply characteristics
   - (A) Type of water supply ** (61)
     - Municipal or community supply
     - Individual household supply
     - Semi-public water supply
     - Institution, school, church
     - Camp, recreational area
     - Other
   - (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. None
     - b. Chlorine only
     - c. Purification plant — coagulation, settling, filtration, disinfection (circle those applicable)
     - d. Other

10. Point where contamination occurred: (66)
    - Raw water source
    - Treatment plant
    - Distribution system

*See IEM 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. Semi-public 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 4.481
2-75
11. Water specimens examined: (57)
(Specify by "X" whether water examined was original (drunk at time of outbreak) or checkup (collected before or after outbreak occurred).

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ORIGINAL</th>
<th>CHECK UP</th>
<th>DATE</th>
<th>FINDINGS</th>
<th>BACTERIOLOGIC TECHNIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>6/12/74</td>
<td>10 fecal coliforms per 100 ml.</td>
<td>(e.g., fermentation tube, membrane filter)</td>
</tr>
<tr>
<td>Examples:</td>
<td></td>
<td>X</td>
<td>6/12/74</td>
<td>23 total coliforms per 100 ml.</td>
<td></td>
</tr>
<tr>
<td>Tap water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw water</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.) (58)  
<table>
<thead>
<tr>
<th>SPECIMEN</th>
<th>NO. PERSONS</th>
<th>FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Stool</td>
<td>11</td>
<td>8 Salmonella typhi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 negative</td>
</tr>
</tbody>
</table>

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
- Interruption of disinfection
- Inadequate disinfection
- Seepage of sewage
- Deficiencies in other treatment processes
- Flooding, heavy rains
- Cross-connection
- Use of untreated water
- Back-connection
- Use of supplementary source
- Water inadequately treated
- Contamination of mains during construction or repair

16. Etiology: (69-70)  
- Pathogen: Suspected ........................................... 1
- Chemical: Confirmed ............................................. 2 (Circle one)
- Other: 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. (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.

CSC 4.461 (Back)  
2-79
F. LINE LISTING OF WATERBORNE DISEASE OUTBREAKS
## F. Line Listing of Waterborne Disease Outbreaks, 1975

<table>
<thead>
<tr>
<th>State</th>
<th>Month</th>
<th>Disease</th>
<th>Cases</th>
<th>Type of System</th>
<th>System Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>June</td>
<td>Acute gastrointestinal illness</td>
<td>500</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>Arkansas</td>
<td>August</td>
<td>Acute gastrointestinal illness</td>
<td>23</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>California</td>
<td>May</td>
<td>Acute gastrointestinal illness</td>
<td>80</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>California</td>
<td>June</td>
<td>Acute gastrointestinal illness</td>
<td>900</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>California</td>
<td>July</td>
<td>Acute gastrointestinal illness</td>
<td>19</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>Idaho</td>
<td>September</td>
<td>Giardiasis</td>
<td>0</td>
<td>Individual</td>
<td>1</td>
</tr>
<tr>
<td>Indiana</td>
<td>April</td>
<td>Acute gastrointestinal illness</td>
<td>1,400</td>
<td>Municipal</td>
<td>4</td>
</tr>
<tr>
<td>Louisiana</td>
<td>May</td>
<td>Fuel oil poisoning</td>
<td>26</td>
<td>Semi-public</td>
<td>5</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>February</td>
<td>Hepatitis</td>
<td>17</td>
<td>Individual</td>
<td>1</td>
</tr>
<tr>
<td>Minnesota</td>
<td>June</td>
<td>Acute gastrointestinal illness</td>
<td>136</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>Montana</td>
<td>August</td>
<td><em>Shigella sonnei</em></td>
<td>56</td>
<td>Semi-public</td>
<td>2</td>
</tr>
<tr>
<td>New Jersey</td>
<td>January</td>
<td>Acute gastrointestinal illness</td>
<td>390</td>
<td>Semi-public</td>
<td>2</td>
</tr>
<tr>
<td>New Jersey</td>
<td>April</td>
<td>Acute gastrointestinal illness</td>
<td>350</td>
<td>Municipal</td>
<td>5</td>
</tr>
<tr>
<td>New Jersey</td>
<td>June</td>
<td>Lawn herbicide</td>
<td>4</td>
<td>Municipal</td>
<td>4</td>
</tr>
<tr>
<td>Ohio</td>
<td>June</td>
<td>Acute gastrointestinal illness</td>
<td>140</td>
<td>Semi-public</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Date</td>
<td>Condition</td>
<td>Quantity</td>
<td>Water Source</td>
<td>Code</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
<td>------------------------------------</td>
<td>----------</td>
<td>-------------------</td>
<td>------</td>
</tr>
<tr>
<td>Oregon</td>
<td>June</td>
<td>Enterotoxigenic <em>Escherichia coli</em></td>
<td>1,000</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>Oregon</td>
<td>September</td>
<td>Acute gastrointestinal illness</td>
<td>7</td>
<td>Semi-public</td>
<td>1</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>July</td>
<td>Acute gastrointestinal illness</td>
<td>88</td>
<td>Semi-public</td>
<td>2</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>August</td>
<td>Acute gastrointestinal illness</td>
<td>37</td>
<td>Semi-public</td>
<td>3</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>August</td>
<td>Acute gastrointestinal illness</td>
<td>5,000</td>
<td>Municipal</td>
<td>4</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>October</td>
<td>Acute gastrointestinal illness</td>
<td>100</td>
<td>Semi-public</td>
<td>2</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>March</td>
<td>Acute gastrointestinal illness</td>
<td>550</td>
<td>Municipal</td>
<td>4</td>
</tr>
<tr>
<td>South Carolina</td>
<td>October</td>
<td>Ethyl acrylate</td>
<td>7</td>
<td>Municipal</td>
<td>4</td>
</tr>
<tr>
<td>Tennessee</td>
<td>July</td>
<td>Acute gastrointestinal illness</td>
<td>40</td>
<td>Semi-public</td>
<td>5</td>
</tr>
</tbody>
</table>

*(1) Untreated surface water (2) Untreated ground water (3) Treatment deficiencies (4) Deficiencies in distribution system (5) Miscellaneous*
IV. Outbreaks on Cruise Ships and Aircraft

This report summarizes data on outbreaks of gastrointestinal illness on cruise ships or aircraft that were reported to CDC in 1975.

A. Definition of Outbreak

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

After such an incident is reported, the need for a full investigation is determined by the severity, timing, and magnitude of the problem. The outbreaks tabulated in this report (Table 1) are the incidents that have been fully investigated by CDC. These investigations usually included questionnaire surveys of passengers and crew, detailed evaluation of sanitation, and laboratory analysis of food, water, environmental, and patient specimens. The Quarantine Division evaluated 5 additional incidents with medical log reviews and environmental inspections only.

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Date</th>
<th>Port</th>
<th>Length Of Cruise (Days)</th>
<th>Number of Passengers</th>
<th>Percent of Passengers Ill</th>
<th>Etiology</th>
<th>Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>February</td>
<td>Miami</td>
<td>7</td>
<td>742</td>
<td>42</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>B</td>
<td>February</td>
<td>Port</td>
<td>12</td>
<td>734</td>
<td>61</td>
<td>Vibrio</td>
<td>Shrimp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Everglades</td>
<td></td>
<td></td>
<td></td>
<td>parahaemolyticus</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>September</td>
<td>Miami</td>
<td>14</td>
<td>612</td>
<td>44</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>D</td>
<td>September</td>
<td>San Juan</td>
<td>7</td>
<td>559</td>
<td>31</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>E</td>
<td>November</td>
<td>Port</td>
<td>12</td>
<td>365</td>
<td>29</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Everglades</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Water</td>
</tr>
<tr>
<td>F</td>
<td>December</td>
<td>Honolulu</td>
<td>7</td>
<td>332</td>
<td>9</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>G</td>
<td>December</td>
<td>Los Angeles</td>
<td>52</td>
<td>62</td>
<td>43</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>H_1</td>
<td>December</td>
<td>Miami</td>
<td>4</td>
<td>836</td>
<td>Unknown</td>
<td>Escherichia coli 025</td>
<td>Unknown</td>
</tr>
<tr>
<td>H_2</td>
<td>January</td>
<td>Miami</td>
<td>4</td>
<td>904</td>
<td>31</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

B. Analysis of Data

In 1975 diarrhea outbreaks were investigated on 8 ships (Table 1) and 1 aircraft. Two successive voyages (H_1 and H_2) of 1 ship were involved in 1 outbreak. Seven of the 8 shipboard outbreaks were on Caribbean trips. The 1 outbreak on an aircraft took place after a stop in Alaska where the responsible food was prepared.

In most ship outbreaks neither the vehicle of transmission nor the etiology could be determined (Table 1). On vessel B Vibrio parahaemolyticus spread by contaminated shrimp caused the outbreak. On vessel H an enterotoxigenic Escherichia coli serotype O25 caused the outbreak; however, the vehicle was not determined. Staphylococcus aureus caused the aircraft outbreak.

Details of the V. parahaemolyticus outbreak were included in the 1974 Annual Summary. The following information on 2 ship outbreaks (vessels E and H) and the aircraft outbreak has been excerpted from the Morbidity and Mortality Weekly Report.

Diarrheal Illness Aboard a Cruise Ship 
(MMWR 24(49):419, 1975)

On the November 13-25 cruise of Vessel E, 100 of 343 passengers (29.2%) and 16 of 256 crew members (6.3%) experienced a diarrheal illness. According to questionnaires
these 599 individuals answered at the completion of their journey, symptoms included abdominal cramps (49%), headache (35%), nausea (34%), vomiting (25%), and fever (17%). The median duration of illness was approximately 2 days. Twenty-nine percent of the ill passengers consulted the ship's medical staff, and 29% were confined to their cabins for at least 1 day because of illness.

One crew member became ill on November 12, the day before the cruise began. Three additional crew members and 9 passengers became ill before the ship's first stop on November 15 (Figure 1). Nine of the 16 crew members who developed diarrhea were food handlers; all but 1 of them continued to work in the kitchen while ill. The questionnaire, completed by 94% of the passengers, demonstrated a statistically significant association between illness and consumption of water aboard the ship (Table 2).

Cultures of rectal swabs obtained from ill and well passengers and crew on November 25 were negative for salmonellae, shigellae, and pathogenic vibrios. No coliform bacteria were found in samples from the ship's water distribution and storage system; however, the system had recently been chlorinated.

On October 20, 1975, the Center for Disease Control had conducted a routine sanitation inspection of the ship's facilities and found that the ship did not meet the minimum standards recommended by CDC. Multiple deficiencies were found in the potable water system. Among these were that: 1) the water was not chlorinated when it was pumped into the ship; 2) no free chlorine was detectable in the water distribution system; and 3) some potable water faucets were not adequately equipped to prevent back siphonage. The findings and recommendations of the inspection team were given to the ship's captain, the ship's agent, and the shipping company. On November 13, the day the cruise started on which the outbreak occurred, a follow-up inspection revealed that the deficiencies had not been corrected. The deficiencies were again called to the attention of the ship's captain.

Table 2

<table>
<thead>
<tr>
<th>Glasses per Day</th>
<th>Ill *</th>
<th>Well</th>
<th>% Ill</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>41</td>
<td>14.6</td>
</tr>
<tr>
<td>&gt;1</td>
<td>91</td>
<td>164</td>
<td>35.7</td>
</tr>
</tbody>
</table>

Fishers 2-tail test p = .004

*All passengers were asked how much water they drank before the onset of illness.

A follow-up inspection conducted on December 5, 1975, before the Vessel E resumed its cruise schedule, revealed that the major deficiencies in the water system had been corrected, and the remaining items were being repaired.
Editorial Note

Epidemiologic investigation found an association between diarrheal illness and consumption of drinking water on board the ship. The multiple deficiencies in the water system noted on 2 previous inspections may have contributed to this outbreak.

**Diarrheal Illness on a Cruise Ship Caused by Enterotoxigenic Escherichia coli**

*(MMWR 25(29):229, 1976)*

An outbreak of diarrheal illness occurred aboard Vessel N on 2 successive 4-day cruises from December 25, 1975, to January 2, 1976. A non-motile enterotoxigenic strain of Escherichia coli serotype O25 producing only heat-labile enterotoxin was isolated from passengers and crew on both cruises.

A limited survey of 155 (18%) of 863 passengers on voyage 1 and a more complete survey of 829 (92%) of 904 passengers on voyage 2 revealed that at least 64 passengers on voyage 1 and 259 (31%) passengers on voyage 2 had experienced a diarrheal illness during the voyage. Other symptoms experienced by the passengers included headache, nausea, vomiting, abdominal cramps, and fever (Table 3).

**Table 3**

*Symptoms Associated with Diarrhea in Passengers on 2 Cruises,*

December 26, 1975 - January 2, 1976

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Cruise 1</th>
<th>Cruise 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal cramps</td>
<td>87%</td>
<td>83%</td>
</tr>
<tr>
<td>Nausea</td>
<td>81%</td>
<td>55%</td>
</tr>
<tr>
<td>Headache</td>
<td>60%</td>
<td>44%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>85%</td>
<td>19%</td>
</tr>
<tr>
<td>Fever (subjective)</td>
<td>33%</td>
<td>25%</td>
</tr>
</tbody>
</table>

*FIGURE 2. Diarrheal illness among passengers and crew,*

Vessel N

*339 crew sampled*

The median duration of illness on both cruises was 2 days; however, many passengers were still ill at the time of the surveys. Illnesses began as early as 12 hours after boarding and both outbreaks peaked in 36-48 hours (Figure 2).

Crew members were not surveyed on cruise 1; however, 4 members were treated for diarrhea by the ship's physician. Twenty-six (7.7%) of 339 crew members surveyed on cruise 2 reported diarrhea; 5 of the crew members handled food or beverages while ill.

Passengers on cruise 2 were asked about food and water consumption during the first 24 hours of the cruise. Analysis revealed an association between diarrhea and eating crabmeat cocktail (*p*<.001). Consumption of 1 or more glasses of water per day was also associated with illness (*p*<.05). On cruise 1, no association between ship's water or ice and illness could be demonstrated. An environmental survey revealed numerous deficiencies in food handling practices.
Non-motile enterotoxigenic Escherichia coli, serotype 025, producing heat-labile (LT) enterotoxin, was isolated from 29 (83%) of 35 ill passengers and 6 (40%) of 15 well passengers from the 2 voyages (p<.01). Two of 8 culture-positive passengers had a 4-fold rise in LT enterotoxin antibody titer when acute and convalescent sera were tested. Fourteen (88%) of 16 ill crew were infected with E. coli 025 compared with 1 (7%) of 14 well crew members (p<.0001).

Salmonella senftenberg was isolated from 2 passengers (who did not have E. coli 025) on cruise 1 and from liver pate and cooked lobster on the same cruise. Water, ice, environmental cultures, and food specimens were negative for E. coli.

To correct the deficiencies in food and drink handling practices, the line employed a sanitary to institute and supervise proper food handling practices. Investigation also revealed that refrigeration on the vessel was deficient and that freshly distilled water was not being chlorinated, although the main water distribution system was adequately chlorinated. After refrigeration facilities were improved and an automatic chlorinator for the distillation system was installed, the vessel sailed on its next voyage on January 3. No outbreaks of diarrhea have been reported in subsequent cruises of the vessel.

Editorial Note

Enterotoxigenic Escherichia coli is a well documented cause of diarrheal illness; however, this is the first reported outbreak caused by E. coli producing only LT enterotoxin. The mode of transmission in this outbreak is unclear.

S. senftenberg possibly contributed to the outbreak on cruise 1. The most likely vehicle of transmission was contaminated food since the same organism was recovered from 2 food items that were eaten without additional cooking.

Outbreak of Staphylococcal Food Poisoning Aboard an Aircraft
(MMMR 24(7):57, 1975)

On February 2, 1975, 196 (57%) of 343 passengers and 1 of 20 crew members aboard a chartered commercial aircraft flying from Tokyo to Copenhagen, with an interin stop in Anchorage, developed a gastrointestinal illness characterized by diarrhea (88%), vomiting (82%), abdominal cramps (74%), and nausea (68%). The illness began occurring shortly before the plane landed in Copenhagen after an 8½ hour flight from Anchorage. One hundred forty-three (73%) of the ill passengers and the 1 crew member were hospitalized in Copenhagen. Approximately 30 passengers required intravenous fluids, but there were no deaths or serious sequelae.

A snack was served aboard the flight approximately 1 hour after the plane left Anchorage; breakfast was served approximately 5½ hours later, 1½-2 hours before the plane landed in Copenhagen. Four galleys were used to prepare food and all passengers received the same food.

Epidemiologic investigation revealed that 115 (86%) of 133 passengers sitting in the front of the plane and served food prepared in galleys 1 and 2 were ill, compared with 81 (33%) of 210 passengers sitting in the area served food prepared in galleys 3 and 4 (p<.001). Food specific attack rates demonstrated a statistically significant association between illness and consumption of ham at the breakfast meal (Table 4). The ham had been served on top of cheese omelettes. Cases occurred 30 minutes to 5½ hours after eating the breakfast meal with a mean of about 2.5 hours (Figure 3). Except for the 1 crew member who ate ham, none of the crew aboard the aircraft, including the pilots, became ill. Since it was suppertime for the crew, which had boarded in Anchorage, they were served a steak dinner instead of the breakfast meal. Some of the crew ate the same snack as the passengers.

The snack and breakfast were prepared in Anchorage by a catering company owned by the airline. Three cooks were involved in the preparation of the ham and omelettes. Cooks No. 1 and No. 2 and assistant No. 1 worked from 11:00 a.m. to 1:30 p.m. on February 1. They first cracked and mixed 120 dozen eggs. Cook No. 2 then made 133 omelettes for use in galleys 1 and 2, and cook No. 1 placed ham slices on these omelettes. This ham had been sliced and fried the previous day by assistant No. 1 and refrigerated overnight. Cook No. 1 then made 72 omelettes for use in galleys 3 and 4, and cook No. 2 put ham slices on these omelettes.
Cook No. 3 and assistant No. 2 worked from 2:00 p.m. to 5:00 p.m. Cook No. 3 made omelettes for the remaining passengers served by galleys 3 and 4, and assistant No. 2 placed ham slices on these omelettes. The ham and omelettes were stored at room temperature during the 6 hours required for preparation. Following preparation, this food was placed for 14½ hours in a holding room where the temperature was measured at 10°C (50°F) before and after the outbreak. Beginning about 7:30 a.m. the next day, the snack and breakfast food were loaded onto the plane. The snack was refrigerated, but the breakfast food was stored at room temperature in the galley ovens until it was heated just prior to serving.

Coagulase-positive Staphylococcus aureus lysed by group III phages 53 and 83a was isolated from an inflamed lesion on a finger on the right hand of Cook No. 1, from fecal and other specimens from 5 ill patients, from 3 leftover ham samples, and from 2 leftover omelette samples. S. aureus with the same phage pattern was also isolated from the wrist of cook No. 3 and the nose of assistant No. 2. S. aureus lysed by group I phages 29, 52, 80, 81, and 85 was isolated from 1 patient, from 1 of the omelette samples, and from the nose of cook No 2. Assistant No. 1 was negative for S. aureus. The antiibogram patterns of the 2 S. aureus phage types were different. At the U.S. Food and Drug Administration Laboratories the phage group III strain was found to produce type D enterotoxin, while the phage group I strain did not produce enterotoxin. Type D enterotoxin was isolated from leftover ham and omelette.

Editorial Note
This large foodborne outbreak resulted from ham that had been handled by a cook who had an inflamed finger lesion from which S. aureus was cultured. The ham was then held at room temperature for a sufficient amount of time to allow growth of S. aureus.
and enterotoxin production. Staphylococcal enterotoxin is heat stable and not readily destroyed at ordinary cooking temperatures (1). *S. aureus* carriage may be found in up to 50% of foodhandlers and is especially high in persons with skin infections; however, this outbreak probably would not have occurred had the food been handled properly. Food served aboard aircraft should be refrigerated prior to heating and serving. Food handlers on the ground and crew members who work in aircraft galleys should be educated in proper food handling techniques and particularly in the risks involved in storing food at room temperature for prolonged periods.

This outbreak emphasizes the importance of serving pilots different food from that of the passengers and each other just before and during a flight.

Reference
V. REFERENCES

GENERAL

2. Food Research Institute: Annual Report for 1974, University of Wisconsin-Madison, Wisconsin

BACTERIAL

Bacillus cereus


Brucella


Clostridium botulinum


Clostridium perfringens


Escherichia coli


Salmonella


**Shigella**


**Staphylococcus**


**Group A Streptococcus**


**Vibrio cholerae**


**Vibrio parahaemolyticus**


**CHEMICAL**

**Heavy Metal**

**Cadmium**


**Copper**

Tin


Zinc


Ichthyosarcotoxin

Ciguatoxin


Puffer Fish (tetrodotoxin)


Scombrototoxin


Monosodium Glutamate


Mushroom Poison


Paralytic and Neurotoxic Shellfish Poison

PARASITIC

Anisakidae


T. spiralis


G. lamblia


T. gondii


VIRAL

Hepatitis A

VI. ARTICLES ON FOODBORNE AND WATERBORNE DISEASE OUTBREAKS, 1975, TAKEN FROM MORBIDITY AND MORTALITY WEEKLY REPORT

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*Bacillus cereus* Food Poisoning-Wisconsin 24(36):306

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*Botulism-Nevada* 24(14):131
*Botulism and Improper home canning-California* 24(27):236
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Trichinosis from bear meat—California 25(21):171

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