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WATER-RELATED DISEASES SURVEILLANCE ANNUAL SUMMARY 1983

Table of Contents

I. INTRODUCTION

Since 1971 the Centers for Disease Control (CDC) has tabulated foodborne and waterborne disease outbreak data separately and reported these data in annual reports. The Water-related Diseases Activity has set the following goals: 1) to determine the frequency of epidemics of water-related diseases in the United States, 2) to characterize the epidemiology of water-related diseases, 3) to disseminate information on prevention and control of water-related diseases to appropriate public health personnel, 4) to train federal, state, and local health department personnel in epidemiologic techniques for the investigation of water-related disease outbreaks, and 5) to collaborate with local, state, other federal and international agencies in initiatives concerning prevention of water-related diseases. Also included in the responsibilities of the Water-related Diseases Activity is the investigation of outbreaks of acute gastrointestinal disease on ocean-going vessels.

II. WATERBORNE DISEASE OUTBREAKS, 1983

In 1983, 19 states reported 40 outbreaks of waterborne disease, involving 20,905 cases, to the Centers for Disease Control (CDC).

A. Definition of Terms

A waterborne disease outbreak is an incident in which 1) 2 or more persons experience similar illness after consumption or use of water intended for drinking, and 2) epidemiologic evidence implicates the water as the source of illness. In addition, a single case of chemical poisoning constitutes an outbreak if laboratory studies indicate that the water was contaminated by the chemical. Only outbreaks associated with water intended for drinking are included.

Community public water systems (municipal systems) are public or investor-owned and serve large or small communities, subdivisions or trailer parks of at least 15 service connections or 25 year-round residents. Noncommunity public water systems (semi-public water systems) are those of institutions, industries, camps, parks, hotels, or service stations that may be used by the general public. Individual systems (private water systems), generally wells and springs, are those used by single or several residences or by persons traveling outside populated areas. These definitions correspond to those in the Safe Drinking Water Act (PL 93-523) of 1974.

B. Sources of Data

State health departments report waterborne disease outbreaks to CDC on a standard reporting form (Section J). In addition, the Health Effects Research Laboratory of the Environmental Protection Agency (EPA) receives information from state EPA offices, and this information is used to corroborate, add to or exclude outbreaks reported to CDC. Representatives from CDC and EPA review and summarize outbreak data and also work together in the investigation and evaluation of waterborne disease outbreaks. In addition, upon request by state health departments, CDC and EPA offer epidemiologic assistance, provide consultation in the engineering and environmental aspects of water treatment, and, when indicated, collect large-volume water samples for identification of viruses, parasites, and bacterial pathogens.

C. Interpretation of Data

The limitations of the data in this report must be appreciated to avoid misinterpretation.

The number of waterborne disease outbreaks reported to CDC and EPA clearly represents a fraction of the total number that occur. Since investigations were

sometimes incomplete or conducted long after the outbreak, the waterborne hypothesis could not be proved in all instances; however, it was the most logical explanation in these outbreaks. The likelihood of an outbreak coming to the attention of health authorities varies considerably from 1 locale to another depending largely upon consumer awareness, physician interest, and disease surveillance activities of state and local health and environmental agencies. Large interstate outbreaks and outbreaks of serious illness are more likely to come to the attention of health authorities. The quality of investigation conducted by state or local health departments varies considerably according to the department's interest in waterborne diseases and its budgetary, investigative, and laboratory capabilities. This report should not be the basis for firm conclusions about the true incidence of waterborne disease outbreaks, and it should not be used to draw firm conclusions about the relative incidence of waterborne diseases of various etiologies. The number of reported outbreaks of different etiologies may depend upon the interest of a particular health department or individual. For example, if an epidemiologist or microbiologist becomes interested in Giardia lamblia or Norwalk-like viruses, he or she is more likely to confirm outbreaks caused by these agents. Furthermore, a few outbreaks involving large numbers of persons may vastly alter the relative proportion of cases attributed to various etiologic agents.

These data are important, however, in revealing the etiologies of reported waterborne disease outbreaks, the seasonality of outbreaks, and the deficiencies in water systems that most frequently result in outbreaks. As in the past, the pathogens responsible for many outbreaks in 1983 were not determined. It is hoped that more complete epidemiologic investigations, 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 1983, 40 waterborne disease outbreaks involving an estimated 20,905 persons were reported to CDC and EPA. This represents the largest number of cases reported since surveillance began in 1971 (Table 1).

Table 1 Waterborne Disease Outbreaks, by Year and Type of System, United States, 1971-1983

	Community	Noncommunity	Private	TOTAL	TOTAL CASES
1971	5	10	4	19	5182
1972	10	18	2	30	1650
1973	5	16	3	24	1784
1974	11	10	5	26	8363
1975	6	16	2	24	10879
1976	9	23	3	35	5068
1977	12	19	3	34	3860
1978	10	18	4	32	11435
1979	23	14	4	41	9720
1980	23	22	5	50	20008
1981	14	16	2	32	4430
1982	22	12	6	40	3456
1983	29	6	5	40	20905
TOTAL (%)	179 (41.9)	200 (46.8)	48 (11.2)	427	106740

Nineteen states reported at least 1 outbreak (Section H). Colorado reported more outbreaks than any other state (9/40 - 22.5%).

Table 2 shows the number of outbreaks and cases by etiology and type of water system. Of the 40 outbreaks, 15 (38.5%) were of unknown etiology and were designated as "acute gastrointestinal illness" (AGI). This category includes outbreaks characterized by upper or lower gastrointestinal symptoms for which no etiologic agent was identified. The etiologies of the remaining 25 (62.5%) outbreaks were confirmed: G. lamblia (17), Hepatitis A (3), Salmonella (2), Shigella (1), Campylobacter (1) and chemical (1).

Table 2 Waterborne Disease Outbreaks by Etiology and Type of Water System, 1983

	Public Water Systems				Private Water Systems		Total	
	Community		Noncommunity					
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
AGI*	8	4612	6	11875	1	11	15	16498
Giardia	16	2203	0	0	1	4	17	2207
Hepatitis A	1	6	0	0	2	158	3	164
Salmonella	2	1150	0	0	0	0	2	1150
Shigella	0	0	0	0	1	12	1	12
Campylobacter	1	871	0	0	0	0	1	871
Chemical	1	3	0	0	0	0	1	3
Total	29	8845	6	11875	5	185	40	20905

*Acute gastrointestinal illness of unknown etiology

Results of microbiologic testing of water samples were reported in 24 outbreaks; evidence of contamination (presence of coliforms or pathogens) was found in 18 (75%). Water sample filtration for Giardia cysts was performed in 12 of the 17 Giardia outbreaks; cysts were found in 9 (75%).

Most outbreaks involved community (72.5%) public water systems. Outbreaks attributed to water from community public water systems affected an average of 305 persons compared with 1,979 persons in noncommunity public water system outbreaks (11,400 persons in 1 outbreak involving a noncommunity water system) and 37 persons in outbreaks involving individual water systems (Table 2). Use of untreated or inadequately treated water was documented in 34 (85%) of the outbreaks (Table 3). Outbreaks occurred in every month of the year but most frequently in June through September (Table 4).

Table 3 Waterborne Disease Outbreaks, by Type of System and Type of Deficiency, 1983

	Public Water Systems		Private Water Systems	Total
	Community Outbreaks	Noncommunity Outbreaks	Outbreaks	Outbreaks
Untreated surface water	3	0	0	3
Untreated ground water	2	5	5	12
Treatment deficiencies	18	1	0	19
Deficiencies in distribution system	4	0	0	4
Miscellaneous				
Multiple deficiencies	2	0	0	2
TOTAL	29	6	5	40

Table 4 Waterborne Disease Outbreaks, by Month of Occurrence, United States, 1983

Month	Number of Outbreaks
January	6
February	0
March	1
April	1
May	3
June	7
July	4
August	8
September	3
October	4
November	3
December	0
Total	40

Outbreaks in recreational areas continued to be a problem in 1983, accounting for 7 (17.5%) of the outbreaks and 11,886 (57%) of the cases. The 6 outbreaks associated with noncommunity public water systems involved water supplies at recreational areas (2), at camps (2), at a resort (1), and at a campground (1) used for a religious festival.

In 3 of the 15 outbreaks of acute gastroenteritis of unknown etiology an incubation period was reported. In these outbreaks the median incubation period was $\leq$48 hours, and the mean was approximately 17 hours.

E. Comments

Although much of the increase in cases of water-related diseases in 1983 can be attributed to a single outbreak, there was still an appreciable increase in cases compared with the number of cases reported in 1982. The increase in 1983 may well be due to more complete reporting rather than an actual increase. The water-related disease surveillance system is, for the most part, a passive one, and there is evidence to suggest that this report contains only a small and variable fraction of the outbreaks and cases that occur each year in the United States. Supporting this is the fact that 2 states, Colorado and Pennsylvania, reported a full 40% of all the outbreaks in 1983. Through contracts with EPA Colorado has received federal funds in the past for improving surveillance for water-related disease outbreaks. Colorado received federal funds in 1980 and 1981, and for these years reported an average of 7 outbreaks per year, in contrast to its previous average of 2 outbreaks per year for the years 1971-1979. Pennsylvania has not received federal funds to improve surveillance, but has a well-developed surveillance system nonetheless.

Water systems used on a seasonal basis such as those in camps, parks, and resorts have an abnormal demand placed upon them by large numbers of visitors during specific periods of the year and in some instances cannot meet such demands. For the most part these are noncommunity systems. Such water supply systems, especially those at campgrounds and parks, must be reevaluated and monitored, and corrections made to ensure the continued provision of safe water during periods of increased demand. For example, 1 outbreak in 1983 involved an estimated 11,400 of 20,000 persons attending a religious festival in Pennsylvania: this festival was held at a campground that usually serves only 168 permanent residents. The large outbreaks

that occurred in 1975 in Crater Lake National Park (1) and Yellowstone National Park (2) underscore the problems related to water supplies that can occur in recreational areas.

In 1983, the number of cases related to noncommunity and individual systems was 1.36 times the number related to community systems. EPA estimates that there are 180 million community, 20 million noncommunity, and 30 million individual water system users in the United States, so that the rate of illness was far greater for noncommunity system users than for community system users.

Two pathogens followed recent trends in 1983. G. lamblia was the most frequently identified pathogen for the sixth consecutive year. It caused 43% of the outbreaks, the highest percentage since the present surveillance system began in 1971. The increased isolation rate of this parasite in recent years can be attributed to more active investigation of unfiltered water systems (such as at ski resorts) in Colorado. Hepatitis A--from fecally contaminated ground water--caused 3 outbreaks in 1983, as it did in 1982.

Outbreaks caused by Norwalk agent were not reported in 1983, but accounted for 3 outbreaks in 1982. Fourfold rises in antibody titer to the Norwalk agent must be identified in order to specify Norwalk agent as the responsible etiology; logistic, economic, and laboratory problems continue to hamper attempts to identify Norwalk-associated outbreaks. Although rotavirus was identified as the cause of 1 outbreak in 1981, it was not found in investigated outbreaks in 1982 or 1983. It is possible that many acute gastrointestinal illnesses of unknown etiology represent undiagnosed Norwalk, rotavirus, and other viral disease outbreaks.

Salmonella caused 2 water-related outbreaks in 1983. Salmonella typhimurium was isolated from the stools of 21 ill persons in Oklahoma following the apparent sewage contamination and interruption of disinfection of a municipal water system. S. enteriditis was recovered from the stools of patrons of a restaurant in Washington; an epidemiologic association with iced drinks was demonstrated.

A single outbreak of shigellosis in Wisconsin resulted from recurrent sewage backup and well contamination during large family gatherings at a private residence. In that outbreak, Shigella flexneri was recovered from the stools of 11 of 25 persons who were cultured.

One chemical outbreak, caused by copper, was recorded in 1983. Copper-associated outbreaks have been frequently recorded in the past, and, as in the outbreak in 1983, have usually involved corrosive water acting on copper pipes.

An outbreak caused by waterborne Campylobacter was reported in 1983, but was not similar to the ones reported in 1980 and 1981 (3). In the earlier outbreaks, campylobacteriosis occurred in persons after they drank spring water during outdoor recreational activities such as hiking and camping in a park. The 1983 outbreak, however, apparently resulted from water system contamination by wild birds.

In addition to the 40 outbreaks related to drinking water systems, 7 outbreaks, involving 219 cases, were reported that resulted from contaminated water not meant for drinking (Table 5). Five resulted from swimming in untreated or inadequately treated surface waters. Two outbreaks of Shigella followed the use of water slides at a recreational area and swimming in a park lake, emphasizing that because of the low infective dose of Shigella even non-drinking exposures can result in disease (4). In an outbreak associated with the use of a gunite machine spraying river water, 5 workers became ill after exposure: in the past, outbreaks of gastrointestinal disease following exposures to untreated river water have been sometimes caused by multiple pathogens (5).

There was 1 outbreak in Idaho apparently caused by Plesiomonas shigelloides which did not meet criteria for inclusion as a water-related outbreak. In that instance, a 2-year-old infant was found to have P. shigelloides in his stool during gastrointestinal illness in family members following swimming in a local reservoir. P. shigelloides may be a waterborne agent of intestinal disease in the normal host (6).

Table 5 Waterborne Disease Outbreaks Not Related to Pota e Water Systems, United States, 1983

State	Month	Etiology	Cases	Location	Exposure
CA	Aug	Shigella	40	resort	water slides
IA	Sep	AGI	60	swimming pool	swimming
IL	Jun	Shigella	6	lake (beach)	swimming
IL	Jun	AGI	32	lake (beach)	swimming
MN	Jul	Norwalk	38	city park	swimming
MN	Jul	Norwalk	38	county park	swimming
PA	Jun	AGI	5	river water	gunite machine
		Total	219		

F. References

1. Rosenberg ML, Koplan, JP, Wachsmuth IK, et al. Epidemic diarrhea at Crater Lake from enterotoxigenic Escherichia coli. Ann Intern Med 1977;86:714-8.

2. Center for Disease Control. Gastroenteritis--Yellowstone National Park, Wyoming. Morbidity and Mortality Weekly Rep 1977;26:283.

3. Taylor DN, Brown M, McDermott KT. Waterborne transmission of Camphylobacter enteritis. Microb Ecol 1982;8:347-54.

4. Rosenberg ML, Hazlet KK, Schaefer J, Wells JG, Pruneda RC. Shigellosis from swimming. JAMA 1976;236:1849-52.

5. Center for Disease Control. Shigellosis and Salmonellosis--Morocco. Morbidity and Mortality Weekly Rep 1963;12:438-9.

6. Holmberg SD, Farmer JJ III. Aeromonas and Plesiomonas as causes of intestinal infections. Rev Inf Dis 1984;7:000-00. (Sept-Oct).

G. Listing of Waterborne Outbreak Articles, 1983, from the Morbidity and Mortality Weekly Report

Centers for Disease Control. Outbreak of diarrheal illness associated with a natural disaster--Utah. Morbidity and Mortality Weekly Rep 1983;32:662-4.

H. Reported* Waterborne Outbreaks, United States, 1983

State	Month	Etiology†	Cases	Type of System¶	Deficiency§	Location of Outbreak	Source
CA	Nov	Hepatitis A	6	C	1	Indian reservation	sewage overflow
CO	Jan	Giardia	4	C	3	community	river
CO	Jan	Giardia	11	C	3	community	river
CO	Jan	Giardia	17	C	3	community	river
CO	Apr	AGI	16	C	3	community	untreated spring
CO	May	Giardia	10	C	3	community	stream
CO	Jun	AGI	8	C	3	community	springs
CO	Jun	Giardia	11	C	3	community	reservoir
CO	Jul	AGI	27	C	3	community	river
CO	Oct	Giardia	11	C	5	community	stored water
FL	Mar	Giardia	3	C	3	mobile home park	wells
FL	May	Campylo-bacter	871	C	5	community	settling tank
FL	Jun	AGI	52	C	2	apartment complex	wells
IA	Aug	AGI	92	NC	2	camp	well
ID	Nov	Giardia	44	C	1	community	reservoir
ID	Nov	Giardia	71	C	1	community	river
KY	Sep	Hepatitis A	150	I	2	community	untreated wells
MT	Jul	Giardia	100	C	3	community	surface water
NH	May	Giardia	7	C	3	community	unfiltered water
NM	Aug	Giardia	100	C	3	community	unfiltered water
OK	Jan	Salmonella	400	C	3	community	well
PA	Jun	AGI	11400	NC	3	religious festival	well
PA	Aug	AGI	25	NC	2	recreational area	well
PA	Aug	AGI	200	NC	2	resort	well
PA	Sep	AGI	11	I	2	camp	untreated well
PA	Oct	Giardia	366	C	3	16 communities	sewage-contaminated water shed
PA	Oct	AGI	146	NC	2	recreational area	well, spring
PA	Oct	Giardia	135	C	3	community	stream
TN	Jun	Hepatitis A	8	I	2	church	spring
TX	Aug	AGI	3400	C	3	community	well (aquifer)
UT	Jan	Giardia	41	C	4	community	water main under repair
UT	Aug	Giardia	1272	C	4	community	broken water main
UT	Aug	AGI	12	NC	2	camp	untreated spring
VT	Jan	Copper	3	C	4	community	corrosive water
VA	Jun	Giardia	4	I	2	household	well
WA	Jul	Salmonella	750	C	3	restaurant	new plumbing
WA	Sep	AGI	79	C	2	trailer court	well
WV	Aug	AGI	1000	C	3	community	wells
WV	Jun	AGI	30	C	4	community	cross-connection
WI	Jul	Shigella	12	I	2	family reunion	septic system

* Please see section II.C. for discussion of reporting variables.
† (AGI) acute gastrointestinal illness of unknown etiology
¶ (C) community (municipal); (NC) non-community (semi-public); (I) individual
§ (1) untreated surface water (2) untreated ground water (3) treatment deficiencies (4) distribution system deficiencies (5) miscellaneous

I. Guidelines for Confirmation of Waterborne Disease Outbreaks

Etiologic Agent	Clinical Syndrome	Epidemiologic Criteria
BACTERIAL		
1. Escherichia coli	a) Incubation period: 6-36 hours b) Gastrointestinal syndrome: majority of cases have diarrhea	a) Demonstration of organisms of same serotype in epidemiologically incriminated water and stools of ill persons but not in stools of controls. -OR- b) Isolation of organisms of the same serotype which have been shown to be enterotoxigenic or invasive by special laboratory techniques from stools of most ill persons.
2. Salmonella	a) Incubation period: 6-48 hours b) Gastrointestinal syndrome: majority of cases have diarrhea	a) Isolation of Salmonella organism from epidemiologically implicated water. -OR- b) Isolation of Salmonella organism from stools or tissues of ill persons.
3. Shigella	a) Incubation period: 12-48 hours b) Gastrointestinal syndrome: majority of patients have diarrhea	a) Isolation of Shigella organism from epidemiologically implicated water. -OR- b) Isolation of Shigella organism from stools of ill persons.
4. Campylobacter jejuni	a) Incubation period: usually 2-5 days b) Gastrointestinal syndrome: majority of patients have diarrhea	a) Isolation of Campylobacter organisms from epidemiologically implicated water. -OR- b) Isolation of Campylobacter organisms from stools of ill persons
5. Yersinia enterocolitica	a) Incubation period: 3-7 days b) Gastrointestinal syndrome: majority of patients have diarrhea or cramps	a) Isolation of Yersinia organisms from epidemiologically implicated water. -OR- b) Isolation of Yersinia organisms from stools of ill persons. -OR- c) Significant rise in bacterial agglutinating antibodies in acute and early convalescent sera

Etiologic Agent	Clinical Syndrome	Epidemiologic Criteria
6. Others	Clinical and laboratory data appraised in individual circumstances	
PARASITIC		
1. Giardia lamblia	a) Incubation period: 1-4 weeks b) Gastrointestinal syndrome: chronic diarrhea, cramps, fatigue and weight loss	a) Demonstration of Giardia cysts in epidemiologically incriminated water. -OR- b) Demonstration of Giardia trophs or cysts in stools or duodenal aspirates of ill persons.
2. Entamoeba histolytica	a) Incubation period: usually 2-4 weeks b) Gastrointestinal syndrome: variable from acute fulminating dysentery with fever, chills, and bloody stools to mild abdominal discomfort with diarrhea	a) Demonstration of Entamoeba histolytica cysts in epidemiologically incriminated water. -OR- b) Demonstration of Entamoeba histolytica trophs or cysts in stools of affected persons.
3. Others	Clinical and laboratory data appraised in individual circumstances	
CHEMICAL		
1. Heavy metals Antimony Cadmium Copper Iron Tin, Zinc, etc.	a) Incubation period: 5 min. to 8 hours b) Clinical syndrome compatible with heavy metal poisoning--usually gastrointestinal symptoms, often metallic taste (usually <1 hour)	Demonstration of high concentration of metallic ion in epidemiologically incriminated water.
2. Fluoride	a) Incubation period: usually <1 hour b) Gastrointestinal illness: usually nausea, vomiting, abdominal pain	Demonstration of high concentration of flouride ion in epidemiologically incriminated water.
3. Other chemicals	Clinical and laboratory data appraised in individual circumstances	

Etiologic Agent	Clinical Syndrome	Epidemiologic Criteria
VIRAL		
1. Hepatitis A	a) Incubation period: 14-28 days b) Clinical Syndrome: compatible with hepatitis symptoms, dark urine	Liver function tests compatible with hepatitis in affected persons who consumed the epidemiologically incriminated water
2. Norwalk and Norwalk-like	a) Incubation period: 24-48 hours (range 4-77 hours) b) Gastrointestinal syndrome: vomiting, watery diarrhea, abdominal cramps, often headache	a) Significant rise in antiviral antibody in paired sera -OR- b) Demonstration of virus particles in stools of ill persons by immune-electron microscopy
3. Rotavirus	a) Incubation period: 24-72 hours b) Gastrointestinal syndrome: vomiting, watery diarrhea, abdominal cramps, often with significant dehydration	a) Demonstration of virus in the stools of ill persons by ELISA or electron microscopy or electron microscopy. -OR- b) Significant rise in antiviral antibody in paired sera.
4. Enterovirus	a) Incubation period: 5-10 days (range 3-15 days) b) Syndrome: Enteroviral gastroenteritis is uncommon, although it does occur. Enteroviral infection usually includes other syndromes; poliomyelitis, aseptic meningitis, herpangina, etc.	a) Isolation of virus from ill persons -OR- b) Isolation of virus from epidemiologically implicated water.
5. Others	Clinical and laboratory data appraised in individual circumstances	

J. INVESTIGATION OF A WATERBORNE OUTBREAK (form to be inserted)

DEPARTMENT OF
HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
CENTER FOR INFECTIOUS DISEASES
ATLANTA, GEORGIA 30333

INVESTIGATION OF A WATERBORNE OUTBREAK

Form Approved
OMB No.0920-0004

1. Where did the outbreak occur?

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

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

_____ (3-8)

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

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

4. History of exposed persons:

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

5. Incubation period (hours):

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

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)*:

- ☐ 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 CDC 52.13 (Formerly 4.245) Investigation of a Foodborne Outbreak, Item 7.
**Municipal or community water supplies are public or investor owned utilities. Individual water supplies are wells or springs used by single residences. Semipublic water systems are individual-type water supplies serving a group of residences or locations where the general public is likely to have access to drinking water. These locations include schools, camps, parks, resorts, hotels, industries, institutions, subdivisions, trailer parks, etc., that do not obtain water from a municipal water system but have developed and maintain their own water supply.

CDC 52.12 (f. 4.46l)
REV. 7-81

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

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

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

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

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

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

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

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

- ☐ Overflow of sewage
- ☐ Seepage of sewage
- ☐ Flooding, heavy rains
- ☐ Use of untreated water
- ☐ Use of supplementary source
- ☐ Water inadequately treated
- ☐ Interruption of disinfection
- ☐ Inadequate disinfection
- ☐ Deficiencies in other treatment processes
- ☐ Cross-connection
- ☐ Back-siphonage
- ☐ Contamination of mains during construction or repair
- ☐ Improper construction, location of well/spring
- ☐ Use of water not intended for drinking
- ☐ Contamination of storage facility
- ☐ Contamination through creviced limestone or fissured 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. (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 Centers for Disease Control, Atlanta, Georgia 30333.

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

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

CDC 52.12 (f. 4.461) (BACK)
7-81

III. DISEASE OUTBREAKS RELATED TO RECREATIONAL WATER USE, 1983

A. Sources of Data

As with disease outbreaks associated with drinking water, the sources of data for outbreaks associated with recreational water use are the state epidemiologists and their staffs. However, reporting of these disease outbreaks is not systematic; therefore, the outbreaks reported here also represent a small fraction of the total number that occur. The likelihood of an outbreak coming to the attention of health authorities varies considerably from 1 locale to another, depending largely upon consumer awareness and physician interest. We have included in this section infections or intoxications related to recreational water, but have excluded wound infections caused by water-related organisms.

B. Comments

Eighteen outbreaks related to recreational use of water were reported by state health departments to CDC in 1983 (Section C). Of the 18 outbreaks, 15 were outbreaks of Pseudomonas folliculitis, 2 were outbreaks of external otitis, pharyngitis, and fever, also caused by Pseudomonas aeruginosa, and 1 was an outbreak of pharyngitis (several enteroviruses recovered from throat swabs of ill children).

All 15 dermatitis outbreaks were caused by P. aeruginosa. This is the second largest number of Pseudomonas dermatitis outbreaks reported to CDC since routine tabulation of outbreaks related to recreational water use began in 1978. In 1982, 24 such outbreaks were identified, many in a survey of recreational water use dermatitis (7). In addition to not having such outbreaks reported from the active surveillance done in 1982, the number of outbreaks reported in 1983 may be lower than in 1982 because of waning interest in this problem. Also, many cases of Pseudomonas folliculitis are sporadic cases and are not investigated, or are investigated now by local health districts rather than by state health departments. Thus, many more cases occur than are reported presently by state health departments.

The first outbreak of Pseudomonas folliculitis was reported in 1975 (8). This outbreak and the majority of outbreaks since have been related to whirlpool or hot tub use, although outbreaks related to swimming pool use have been reported (9), and in 1983, an outbreak associated with water slide use was reported (10). CDC recently published suggested health and safety guidelines for public spas and hot tubs (11). There are no known reports of outbreaks having occurred at facilities in which the pool water has been continuously maintained at pH 7.2-7.8 with free residual chlorine levels of at least 1.0 mg/L (12,13).

C. Reported Disease Outbreaks Related to Recreational Water Use, 1983

State	Month	Illness	Cases	Etiology	Location	Source
AZ	Apr	dermatitis	11	Pseudomonas	---	hot tub
AZ	May	dermatitis	24	Pseudomonas	spa at condominium	well
CO	May	dermatitis	45	Pseudomonas	recreational area	hot tub
FL	Aug	otitis externa	10	Pseudomonas	hotel	pool
MA	Jan	dermatitis	4	Pseudomonas	motel	hot tub
ME	Jan	dermatitis	59	Pseudomonas	resort	hot tub
MN	Feb	dermatitis	11	Pseudomonas	motel	whirlpool
MN	Mar	dermatitis	30	Pseudomonas	motel	whirlpool
MN	Aug	dermatitis	16	Pseudomonas	hotel	whirlpool
OR	Apr	dermatitis	2	Pseudomonas	hotel	hot tub
UT	Apr	dermatitis	265	Pseudomonas	recreation area	waterslide
VT	Jan	dermatitis	30	Pseudomonas	resort	hot tub
VT	Nov	dermatitis	16	Pseudomonas	hotel	whirlpool
VA	Feb	dermatitis	2	Pseudomonas	resort	hot tub
VA	Nov	dermatitis	4	Pseudomonas	drug treatment ctr	whirlpool
WI	Jan	dermatitis	6	Pseudomonas	motel	whirlpool
WI	Jul	otitis externa	100	Pseudomonas	private facility	indoor pool
WI	Jul	conjunctivitis; pharyngitis	40	enteroviruses	recreation area	beach

D. References

7. Spitalny KC, Vogt RL, Witherell LE. National survey on outbreaks associated with whirlpool spas. Am J Public Health 1984;74:725-6.

8. McCausland WJ, Cox PJ. Pseudomonas infection traced to motel whirlpool. J Environ Health 1975;37:455-9.

9. Hopkins RS, Abbott DO, Wallace LE. Follicular dermatitis outbreak caused by Pseudomonas aeruginosa associated with a motel's indoor swimming pool. Pub Health Rep 1981;96:246-9.

10. Centers for Disease Control. An outbreak of Pseudomonas folliculitis associated with a waterslide--Utah. Morbidity and Mortality Weekly Rep 1983;32:425-7.

11. Centers for Disease Control. Suggested health and safety guidelines for public spas and hot tubs. Atlanta: Centers for Disease Control, 1981 (HHS publication no. 99-960).

12. Centers for Disease Control. Outbreak of Pseudomonas aeruginosa serotype 0:9 associated with a whirlpool. Morbidity and Mortality Weekly Rep 1981;30:329-31.

13. Gustafson TL, Band JD, Hutcheson RH Jr, Schaffner W. Pseudomonas folliculitis: an outbreak and a review. Rev Infect Dis 1983;5:1-8.

IV. OUTBREAKS OF ACUTE GASTROINTESTINAL DISEASE ON OCEAN-GOING VESSELS

A. Sources of Data

After shipboard outbreaks of typhoid fever (14), viral gastroenteritis, and shigellosis (15) occurred in 1971-1973, a review of ships' medical logs revealed an incidence of gastrointestinal illness on passenger cruise ships of 1% or less on 92% of cruises and 5% or greater on 2% of cruises (16). Shortly thereafter, the Bacterial Diseases Division and Quarantine Division, Bureau of Epidemiology, Center for Disease Control, established a surveillance system for shipboard gastrointestinal illness which required vessel masters to report all persons with diarrheal illness seen by the ship's physician as a part of his request for radio pratique (permission to enter a port). These reports are made by radio 4 to 24 hours before arrival in port and are logged by quarantine officers for forwarding to CDC monthly. In the event that 3% or more passengers on any 1 cruise visit the ship's physician with gastrointestinal illness, a quarantine officer will board and inspect the ship and then telephone a report to the Centers for Disease Control. Based on his report, the Enteric Diseases Branch, Division of Bacterial Diseases, Center for Infectious Diseases, may perform an in-depth investigation of the outbreak.

The Quarantine Division, Center for Prevention Services, performs a vessel sanitation inspection on each cruise ship semiannually or more frequently if indicated by poor sanitary ratings. Since the sanitation rating represents the results of an inspection carried out dockside on a given day, this rating may not reflect the sanitary conditions at sea. In 1978, however, results of the ships' reports of diarrheal illness since 1975 were compared with the vessel sanitation inspection reports for the same period. Outbreaks of diarrheal illness were significantly less frequent on vessels with sanitation scores that met the Public Health Service standards than on vessels that did not (17).

B. Comments

In 1983, CDC personnel investigated 4 outbreaks of diarrheal disease on cruise ships sailing from Miami on 1-week or 2-week excursions in the Caribbean. In the first outbreak, 228 passengers had staphylococcal foodborne disease after eating cream pastries in San Juan and St. Thomas in February (18). In June there were 2 separate outbreaks on 2 vessels caused by *Vibrio parahemolyticus* acquired from lobsters harvested from the Gulf of Mexico; altogether, 194 persons complained of diarrhea, with associated fever and blood in stool. Also, in October, 112 persons reported an acute illness with vomiting and/or diarrhea, and myalgia, following an off-ship luncheon on Grand Cayman Island.

C. References

14. Davies JW, Cox KC, Simon WR, et al. Typhoid at sea: Epidemic aboard an ocean liner. Canad Med Assoc J 1972;106:877-83.

15. Merson MH, Tenney JH, Meyers JD, et al. Shigellosis at sea: An outbreak aboard a passenger cruise ship. Am J Epidemiol 1975;101:165-75.

16. Merson MH, Hughes JM, Wood BT, Yashuk JC, Wells JG. Gastrointestinal illness on passenger cruise ships. JAMA 1975;231:723-7.

17. Dannenberg AL, Yashuk JC, Feldman RA. Gastrointestinal illness on passenger cruise ships, 1975-1978. Am J Pub Hlth 1982;72:484-8.

18. Centers for Disease Control. Staphylococcal food poisoning on a cruise ship. Morbidity and Mortality Weekly Rep 1983;32:294-5.

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