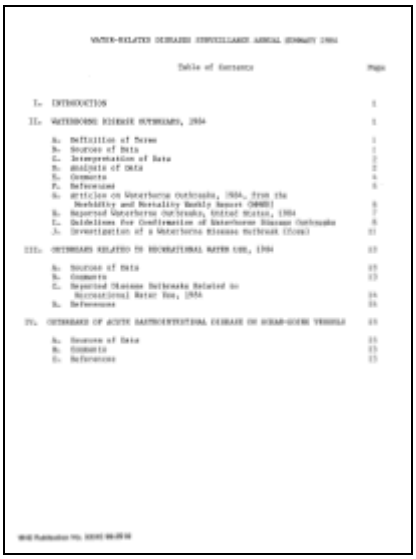

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WATER-RELATED DISEASES SURVEILLANCE ANNUAL SUMMARY 1984

Table of Contents

HHS Publication No. (CDC) 99-2510

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, 1984

In 1984, 14 states reported 26 outbreaks of waterborne disease, involving 1,755 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 U.S. 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 1984 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 1984, 26 waterborne disease outbreaks involving an estimated 1,755 persons were reported to CDC and EPA. This represents the smallest number of cases reported since 1972, and the second smallest number of cases reported since surveillance began in 1971 (Table 1).

Fourteen states reported at least 1 outbreak (Section H). Pennsylvania, Missouri, and Colorado together reported 11 outbreaks, 42% of all outbreaks reported.

The number of reported outbreaks and cases by etiology and type of water system is shown (Table 2). Of the 26 outbreaks, 9 (35%) 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 17 (65%) outbreaks were confirmed: Giardia lamblia (6), Campylobacter (4), chemical (3), Hepatitis A virus (1), Entamoeba histolytica (1), Norwalk virus (1), and Cryptosporidium (1).

Results of microbiologic testing of water samples were reported in 19 (83%) of 23 nonchemical outbreaks; evidence of contamination (presence of coliforms or pathogens) was found in 15 (79%). Water sample filtration for Giardia cysts was performed in 4 of the 6 Giardia outbreaks, and cysts were found in all 4.

Most outbreaks involved community (50%) or individual (35%) water systems. Outbreaks attributed to water from community public water systems affected an average of 83 persons, 148 persons in outbreaks involving noncommunity water systems, and 9 persons in individual water system outbreaks (Table 2). Use of untreated or inadequately treated water was documented in 20 (77%) of the outbreaks (Table 3).

Table 1. Waterborne Disease Outbreaks, by Year and Type of System, United States, 1971-1984

	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
1984	13	4	9	26	1755
TOTAL (%)	192 (42.4)	204 (45.0)	57 (12.6)	453	108495

Table 2. Waterborne Disease Outbreaks by Etiology and Type of Water System, 1984

	Public Water Systems				Private Water Systems		Total	
	Community		Noncommunity					
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
AGI*	3	177	2	187	4	62	9	426
Giardia	4	476	1	400	1	3	6	879
Campylobacter	2	28	1	4	1	9	4	41
Chemical	1	28	0	0	2	2	3	30
Hepatitis A	0	0	0	0	1	7	1	7
Cryptosporidium	1	117	0	0	0	0	1	117
Norwalk virus	1	251	0	0	0	0	1	251
Entamoeba	1	4	0	0	0	0	1	4
Total	13	1081	4	591	9	83	26	1755

*Acute gastrointestinal illness of unknown etiology

Table 3 Waterborne Disease Outbreaks, by Type of System and Type of Deficiency, 1984

	Public Water Systems		Private Water Systems	Total
	Community Outbreaks	Noncommunity Outbreaks	Outbreaks	Outbreaks
Untreated surface water	0	0	0	0
Untreated ground water	1	2	7	10
Treatment deficiencies	9	1	0	10
Deficiencies in distribution system	2	1	1	4
Miscellaneous	1	0	1	2
TOTAL	13	4	9	26

Outbreaks occurred in every month of the year but infrequently in winter months of December, January and February (Table 4).

Outbreaks from contaminated wells were a particular problem in 1984, accounting for 12 (50%) of the 26 outbreaks. These wells were important in outbreaks occuring in various places including the community (3), households (3), at worksites (2), and at recreational centers (2) and events (2).

In 5 of the 9 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 33 hours.

Table 4. Waterborne Disease Outbreaks, by Month of Occurrence, United States, 1984

Month	Number of Outbreaks
January	0
February	2
March	5
April	0
May	2
June	4
July	2
August	3
September	3
October	3
November	2
December	0
Total	26

E. Comments

The number of cases in 1984 (1,755) decreased appreciably compared with the number reported in 1983 (20,905). In 1983, a single outbreak accounted for over 11,000 cases; no such large outbreaks were investigated in 1984. The general decline in reported cases for the past several years, however, may well be due in part to variations in reporting. 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.

The decrease in cases may reflect a true decrease in water-related diseases. There is some evidence to suggest that an actual decrease in water-related disease outbreaks is occurring. Active surveillance in some states reveals defects in water delivery systems, and as these are corrected, the potential for water-related disease outbreaks may be diminished. For example, Colorado has been reporting fewer outbreaks in recent years. Through contracts with EPA, Colorado received federal funds in 1980 and 1981 for improving surveillance for water-related disease outbreaks, 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. In 1984, however, only 3 outbreaks were discovered, despite both active and passive surveillance for water-related disease outbreaks (1). Other states, too, may experience acute increases in water-related diseases as they initially look for problems, followed by a decline in cases as identified problems are corrected.

Another factor which may contribute to a decrease in water-related disease outbreaks is the diminishing numbers of persons obtaining potable water from untreated sources such as private wells. The EPA estimates that only 6% of the U.S. population now regularly receives drinking water from untreated sources (2). Although only 6% of the population receives drinking water from such sources, 10 (38%) of the 26 water-related disease outbreaks reported in 1984 were associated with drinking untreated groundwater; thus, the rate of illness was far greater for those using individual systems--usually untreated wells--than for those using community systems. In a review of 672 waterborne disease outbreaks reported to CDC and EPA in a 35-year period between 1946 and 1980, the 229 outbreaks in non-community systems were almost all caused by use of untreated, contaminated groundwater or by inadequate or interrupted disinfection (3). As the numbers of persons regularly using untreated water decreases, so too should the potential for water-related outbreaks.

The large numbers of visitors place a heavy demand at times upon water systems used on a seasonal basis, such as those in camps, parks, and resorts, and in some instances these systems cannot meet such demands. For the most part these are noncommunity or individual systems. Such water supply systems, especially those at campgrounds and parks, must be periodically reevaluated and monitored, and corrections made to ensure the continued provision of safe water during periods of increased demand. For example, the largest outbreak investigated in 1984 involved an estimated 400 persons at a ski resort who were infected with Giardia after obtaining their drinking water from a snow-making pond because of mechanical failure of water pumps from a treated system. The large outbreaks that occurred in 1975 in Crater Lake National Park (4) and Yellowstone National Park (5) underscore the problems related to water supplies that can occur in recreational areas.

G. lamblia was the most frequently identified pathogen for the seventh consecutive year: this parasite caused 6 (23%) of the 26 outbreaks. The increased isolation rate of Giardia in recent years can be attributed to more active investigation of unfiltered water systems (such as at resorts). More remarkable was the single outbreak of Cryptosporidium, the largest known outbreak in the United States of this recently recognized pathogen. One hundred seventeen persons became infected with this parasite after drinking contaminated water from the community supply; high levels of fecal coliforms were found in the community's well (6). This episode followed an outbreak of Norwalk virus gastroenteritis in the same community 2 months before.

Fewer outbreaks caused by viruses were reported in 1984 than in recent years. Hepatitis A--from fecally contaminated ground water--caused 1 outbreak in 1984, whereas it caused 3 outbreaks each in 1982 and 1983. Only 1 outbreak of Norwalk virus was confirmed in 1984, none in 1983, and 3 in 1982. A fourfold rise in antibody titer is necessary to specify Norwalk virus as the causative agent of an outbreak; logistic, economic and laboratory problems continue to hamper attempts to identify Norwalk-associated outbreaks. Thus, it is possible that many acute gastrointestinal illnesses of unknown etiology represent undiagnosed Norwalk, rotavirus, and other viral disease outbreaks. Given the short incubation periods, short duration of symptoms, and types of symptoms seen, e.g., headache, vomiting, myalgia, in outbreaks of "acute gastrointestinal illnesses of unknown etiology," many of these are probably caused by viruses.

No outbreaks of water-borne Shigella or Salmonella were reported in 1984. These bacteria caused 1 and 2 outbreaks, respectively, in 1983.

Three chemical outbreaks, 2 caused by copper and 1 from crude oil, were recorded in 1984. These 2 outbreaks, as with copper-associated outbreaks in the past, involved corrosive water acting on copper pipes. Back-diffusion into copper pipes of carbonated water into a soda machine and of highly acidic water into a well pumping pipe caused the 2 illnesses investigated in 1984. Crude oil contaminated a community's water supply in Virginia, causing mild gastrointestinal symptoms in 28 persons before the problem was identified.

Four outbreaks caused by waterborne Campylobacter were reported in 1984, and these were similar to ones reported recently (7) in which campylobacteriosis occurred in persons after they drank spring water during outdoor recreational activities such as hiking and camping. The 1984 outbreaks, too, were associated with drinking untreated well or spring water.

F. References

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2. U.S. Environmental Protection Agency. Facilities and population by primary water supply source. Washington, DC: U.S. Environmental Protection Agency, 1984.

3. Lippy EC, Waltrip SC. Waterborne disease outbreaks--1946-1980: a thirty-five-year perspective. J Am Waterworks Assoc 1984;76:60-7.

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

5. Center for Disease Control. Gastroenteritis--Yellowstone National Park, Wyoming. MMWR 1977;26:283.

6. D'Antonio RG, Winn RE, Taylor JP, et al. Outbreaks of Norwalk gastroenteritis and cryptosporidiosis associated with a community water system. Submitted for publication, Ann Intern Med.

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

G. Articles on Waterborne Outbreaks from the Morbidity and Mortality Weekly Report (MMWR)

Centers for Disease Control. Detection of elevated levels of coliform bacteria in a public water system--Connecticut. MMWR 1985;34:142-4.

H. Reported* Waterborne Outbreaks, United States, 1984

State	Month	Etiology†	Cases	Type of System¶	Deficiency§	Location of Outbreak	Source
AK	Sep	Giardia	3	I	2	camp	stream
AK	Oct	Giardia	123	C	3	community	reservoir
CA	Nov	copper	1	I	4	high school	soda machine
CO	Nov	Giardia	13	C	3	community	river
CO	Mar	Giardia	400	NC	3	ski resort	pond
CO	Aug	AGI	50	C	3	community	river
ID	Mar	Campylobacter	6	C	3	community	spring
MA	Sep	Hepatitis A	7	I	2	household	well
MN	Mar	Campylobacter	9	I	2	household	well
MO	Oct	AGI	107	C	4	airport restaurant	sewage overflow
MO	Jun	Entamoeba	4	C	2	trailer park	well
MO	Jun	AGI	2	I	2	household	well
NC	Feb	copper	1	I	5	workshed	well
NY	Jun	Campylobacter	4	NC	2	amusement park	spring
OR	Jun	Campylobacter	22	C	3	community	wells, creek
OR	Jul	Giardia	42	C	3	community	river
OR	Aug	AGI	20	C	4	plywood mills	river
PA	Feb	Giardia	298	C	3	community	river
PA	May	AGI	8	I	2	picnic	well
PA	Aug	AGI	98	NC	2	resort	well
PA	Sep	AGI	34	I	2	bicycle race	private well
PA	Oct	AGI	18	I	2	industry	well
TX	May	Norwalk	251	C	3	community	well
TX	Jul	Cryptosporidium	117	C	3	community	well
WI	Mar	AGI	89	NC	4	restaurant	sewage overflow
VA	Mar	crude oil	28	C	5	community	spring

* 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 fluoride 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- 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	

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

J. INVESTIGATION OF A WATERBORNE OUTBREAK

Form Approved
OMB No. 920-0004

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.

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. (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 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.

III. DISEASE OUTBREAKS RELATED TO RECREATIONAL WATER USE, 1984

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. In this section, we have included infections or intoxications related to recreational water, but have excluded wound infections caused by water-related organisms.

B. Comments

Fourteen outbreaks related to recreational use of water were reported by state health departments to CDC in 1984 (Section C).

Some unusual recreational water-related disease outbreaks were reported in 1984. Two outbreaks related to excess chlorine added to swimming pools were reported. Symptoms in affected persons included minor or moderate skin, conjunctival and bronchial irritation. This is the first year since recreational water- related disease surveillance began in 1978 that chlorine-related illness has been reported. An outbreak of dermatitis affected 30 persons in Alaska; this "swimmer's itch," caused by schistosomal cerceriae, usually occurs as a sporadic illness although occasional small outbreaks have been reported, most recently in 1982. Also, among the unusual outbreaks should be included an outbreak of external otitis caused by *Pseudomonas* and 1 of pharyngitis caused by *Streptococcus* group A.

In addition to outbreaks of gastroenteritis related to drinking water systems, 2 outbreaks occurred among persons who swam in freshwater. One *Shigella sonnei* outbreak involved 29 cases after they had swum in a lake after a 4-year-old child diagnosed with shigellosis had been swimming there; as seen in this outbreak, even nondrinking exposures can result in disease because of the low infective dose of *Shigella* (8). Another outbreak of gastrointestinal illness occurred in 50 children who swam in a camp lake in upstate New York; 20 stool specimens from those affected were described as negative for common bacterial enteric pathogens.

Seven outbreaks of pustular dermatitis ("whirlpool dermatitis") were caused by *P. aeruginosa*. This is the second year in which reports of such outbreaks have decreased. In 1982, 24 such outbreaks were identified, many in a survey of recreational water-use dermatitis (9), and in 1983, 15 such outbreaks were investigated and reported. Various factors may explain this decrease in reported outbreaks in 1984. In addition to not having such outbreaks reported from the active surveillance done in 1982, the number of outbreaks reported in 1984 may be lower than in 1983 because of waning interest in this problem. Also, many cases of *Pseudomonas* folliculitis are sporadic cases and are not investigated, or are now investigated by local health districts rather than by state health departments. Many more cases probably occur than are reported presently by state health departments. Finally, the decrease may reflect a true decrease, as state and local health authorities have investigated these outbreaks in the past and identified treatment problems which are then corrected.

The first outbreak of *Pseudomonas* folliculitis was reported in 1975 (10). This outbreak and the majority of those since have been related to whirlpool or hot tub use, although outbreaks related to swimming pool use have been reported. CDC has published suggested health and safety guidelines for public spas and hot tubs (11). No outbreaks have been reported that involved 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).

Although the number of "whirlpool dermatitis" outbreaks have been decreasing, other potential health problems associated with recreational water use have recently been described which may pose problems in the future. For example, "alpine slide anaphylaxis" is thought to occur when pollen grains are introduced into persons who are allergic to grass and who sustain skin abrasions while riding on amusement slides (13). Also, it has recently been demonstrated that herpes simplex virus may survive in hot tubs and whirlpools, raising the possibility of nonvenereal transmission of this virus in spa facilities (14). Finally Pontiac fever from inhalation of aerosolized antigens of Legionella pneumophila can occur (15). These syndromes all pose potential health problems from recreational water.

C. Reported Disease Outbreaks Related to Recreational Water Use, 1984

State	Month	Illness	Cases	Etiology	Location	Source
AK	Apr	dermatitis	6	Pseudomonas	household	hot tub
AK	Jul	dermatitis	30	schistosomal cercariae	beach	lake
GA	Feb	dermatitis	45	Pseudomonas	college fraternity	hot tub
ID	Jan	otitis externa	2	Pseudomonas	motel	whirlpool
IO	-	bronchitis	3	chlorine	municipal area	public pool
IO	-	dermatitis	3	Pseudomonas	motel	pool
ME	Jan	dermatitis	35	Pseudomonas	condominium	hot tub
MN	Feb	pharyngitis	100	Streptococcus	motel	hot tub
MN	Oct	rash, conjunctivitis	5	chlorine	municipal area	public pool
MN	Nov	dermatitis	16	Pseudomonas	public spa	hot tub
NY	Jul	gastroenteritis	50	AGI*	camp	lake
OH	Jun	shigellosis	29	Shigella	beach	lake
SD	Jan	dermatitis	25	Pseudomonas	municipal area	public pool
SD	Jan	dermatitis	2	Pseudomonas	motel	whirlpool

* (AGI) acute gastrointestinal illness of unknown etiology

D. References

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

A. Sources of Data

After shipboard outbreaks of typhoid fever (18), viral gastroenteritis, and shigellosis (19) 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 (20). 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 the 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 each month. In the event that 3% or more of 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 CDC. Based on this 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 (21).

B. Comments

In January 1984, CDC personnel investigated an outbreak of diarrheal disease on a cruise ship sailing from Miami on 1-week excursions in the Caribbean. Gastrointestinal illness developed in 141 (18%) of the 780 passengers and in 15 (5%) of the 310 crew. Norwalk virus was determined to be the cause of illness, and clustering of illnesses in 2-person cabins and at 4-person dinner tables suggested person-to- person spread over a 4-day period, perhaps by an airborne route (22). Despite continued surveillance of illnesses on cruise ships, this was the only shipboard outbreak of gastrointestinal disease in 1984 and was not apparently due to a common source of contaminated water or food.

C. References

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