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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 infant 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 of sound public health action. Beginning in 1923, the Public Health Service published summaries of outbreaks of gastrointestinal illness attributed to milk. In 1938 reports of outbreaks caused by all foods were added to these summaries. These early surveillance efforts led to the enactment of important public health measures which have had a profound influence in decreasing the incidence of enteric diseases, particularly those transmitted by milk and water.

From 1951 through 1960, reported outbreaks of foodborne illness were reviewed and published annually in Public Health Reports by the National Office of Vital Statistics. In 1961, responsibility for reporting was transferred to the Communicable Disease Center (CDC). From 1961 to 1966, the publishing of annual reviews was discontinued, but pertinent statistics and detailed individual investigations were reported in the Morbidity and Mortality Weekly Report (MMWR).

The present system of surveillance of food- and waterborne diseases began in 1966 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 food- and waterborne outbreaks. In this report data from foodborne disease outbreaks reported to CDC in 1972 and from waterborne outbreaks reported in 1971 and 1972 are summarized.

Food- and waterborne 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 the 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 30-50% of foodborne disease outbreaks reported to CDC in each of the last 5 years. The appreciation in England of Clostridium perfringens as an important foodborne pathogen and an awareness in Japan of the role of Vibrio parahaemolyticus in foodborne illness 15 years before the importance of either organism as a foodborne pathogen was realized in the United States emphasize the need for proper clinical documentation and laboratory analysis in the investigation of foodborne outbreaks. The importance of some foodborne pathogens, e.g., Bacillus cereus and enteropathogenic Escherichia coli still needs to be defined. The etiologic agent(s) responsible for "sewage poisoning," the most commonly reported cause of waterborne outbreaks, also awaits elaboration.

3. Administrative Guidance: The collection of data from outbreak investigations allows for assessment of trends in causative agents and food vehicles and focuses on common errors in food and water handling. By compiling the data into 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 become apprised of the factors involved in food and waterborne outbreaks. With respect to food and water protection, comprehensive surveillance should result in a clearer appreciation of priorities, 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 illnesses.

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 the laboratory evidence for specific etiologic agents is obtained and fulfills specified criteria (see page 30 for criteria).
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 periods--less than 1 hour (likely chemical), 1-6 hours (likely staph), 6-12 hours (likely C. perfringens) and greater than 12 hours (other infectious agents).

B. Source of Data

Participants in foodborne disease surveillance include the general public and local, state, and federal agencies which have responsibility for public health and food protection. Figure 1 depicts various lines of notification between these participants. Complaints of illness originate with the general public (e.g. consumer, physicians, hospitals, food services and processing industries) and are then reported to health departments or regulatory agencies. Most epidemiologic investigations are carried out by local health department personnel (epidemiologists, sanitarians, public health nurses, etc) and are subsequently reported to state health departments. State agencies concerned with food safety frequently participate in the initial investigation of the outbreak and offer laboratory support. Utilizing the standard CDC reporting form (see page 16) a summary of the outbreak is sent to CDC.

Two federal regulatory agencies which have the major responsibilities for food protection, the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA), participate actively in the CDC surveillance program. They report to CDC and to state and local health authorities episodes of foodborne illness which they receive. CDC and state and local health authorities in turn report to FDA or USDA any foodborne disease outbreaks which involve commercial products. Both agencies assist in epidemiologic and laboratory investigations.

This notification system is ideal and variations often occur. If an outbreak is large or if multiple local jurisdictions are involved, a local health department may ask for immediate assistance in its investigation from its state health department. If an outbreak involves illness in persons from more than 1 state, CDC should be notified during the investigation of the outbreak and may provide epidemiologic assistance. CDC also renders assistance in large intrastate outbreaks when requested.

In suspect botulism cases, physicians and health authorities are urged to promptly notify CDC. In such instances CDC works in close cooperation with physicians, state and local health authorities, and FDA or USDA representatives to provide diagnostic and therapeutic consultation and to rapidly identify responsible foods and remove them from further public consumption.

III. WATERBORNE DISEASE OUTBREAKS, 1971-1972

This report summarizes information about waterborne disease outbreaks reported to CDC during 1971 and 1972.

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, usually gastrointestinal, after consumption of contaminated water, and (2) epidemiologic evidence implicates the water as the source of the illness. 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. Source of Data

Reports of waterborne disease outbreaks are reported to CDC by written communications from state health departments. No standard reporting form is used but one is presently being devised. In addition, the Water Supply Research Laboratory, Environmental Protection Agency (EPA), contacts by mail all state water supply agencies to obtain information about additional outbreaks. Officials from CDC and EPA work closely in the evaluation and investigation of waterborne disease outbreaks. When requested by state health department, CDC and EPA can offer epidemiologic assistance and provide expertise in the engineering and environmental aspects of water purification. Data from all outbreaks are reviewed and summarized by representatives from CDC and EPA. A line listing of reported outbreaks in 1971 and 1972 is included (see page 38).

In this report municipal systems refer to public or investor owned water supplies that serve large and 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 are also found in areas without municipal systems but are developed and maintained for use by several residences (e.g. subdivisions) or by industries, camps, parks, resorts, institutions, and hotels, locations where the general public is likely to have access to drinking water.

C. Interpretation of Data

The data included in this summary of waterborne disease outbreaks have limitations similar to that presented in the foodborne disease summary and thus must be used carefully since they represent only a small part of a larger public health problem. These data are helpful in revealing the more important etiologies of waterborne disease, the seasonal occurrence of outbreaks, and the errors in water handling that most frequently result in waterborne disease outbreaks. As in the past, the pathogen(s) responsible for some outbreaks remains unknown. Advances in laboratory techniques and standardization of reporting of waterborne disease outbreaks will hopefully augment our knowledge about waterborne pathogens and the factors responsible for waterborne disease outbreaks.

D. Data

Table 1

There were 47 waterborne disease outbreaks involving 6,817 cases reported to CDC in 1971 and 1972 (Table 1). Of the 47 outbreaks, 21 (45%) were reported to CDC by the EPA. The largest outbreak, involving 3,500 cases, occurred in Pico Rivera, California, in July and August 1971

	Waterborne Outbreaks 1971-1972		
	<u>1971</u>	<u>1972</u>	<u>Totals</u>
Outbreaks	18	29	47
Cases	5,179	1,638	6,817

Figure 1 shows the geographic distribution of these outbreaks by state. Thirty (60%) states reported at least 1 outbreak.

Fig 1 WATERBORNE OUTBREAKS, 1971-1972

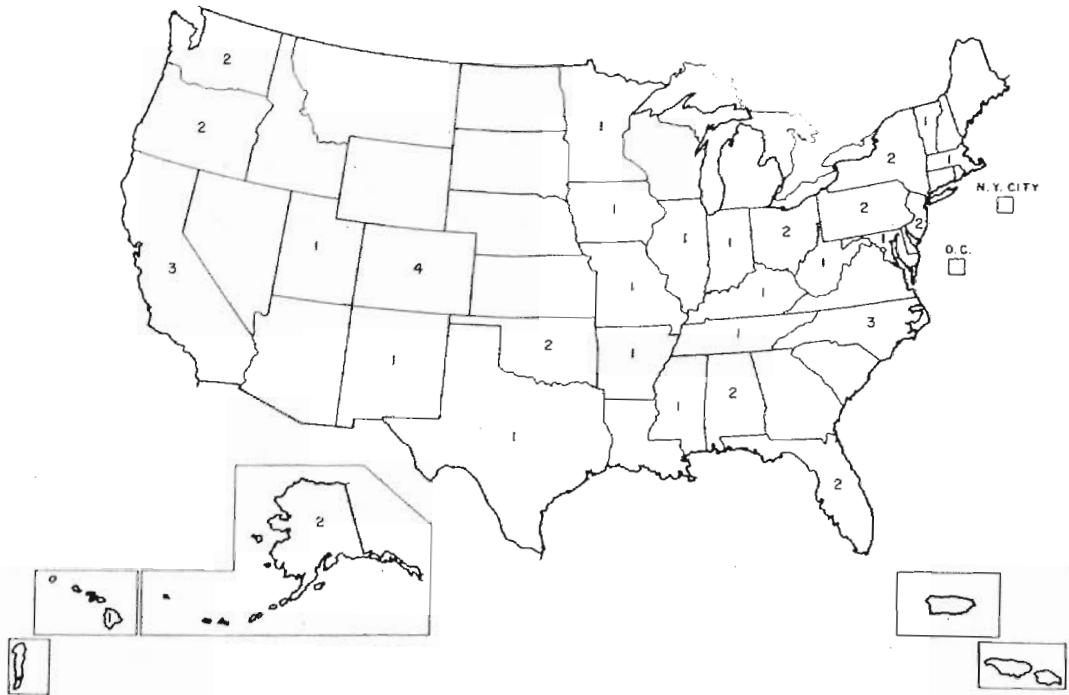


Figure 2 depicts the trend in reported waterborne disease outbreaks over the last 3 decades. In 1971 and 1972 there was an increase in the annual average number of reported outbreaks. This increase probably represents in part a renewed interest in the reporting of disease outbreaks and in other surveillance activities.

FIGURE 2
AVERAGE ANNUAL NUMBER
WATERBORNE OUTBREAKS 1938-1972

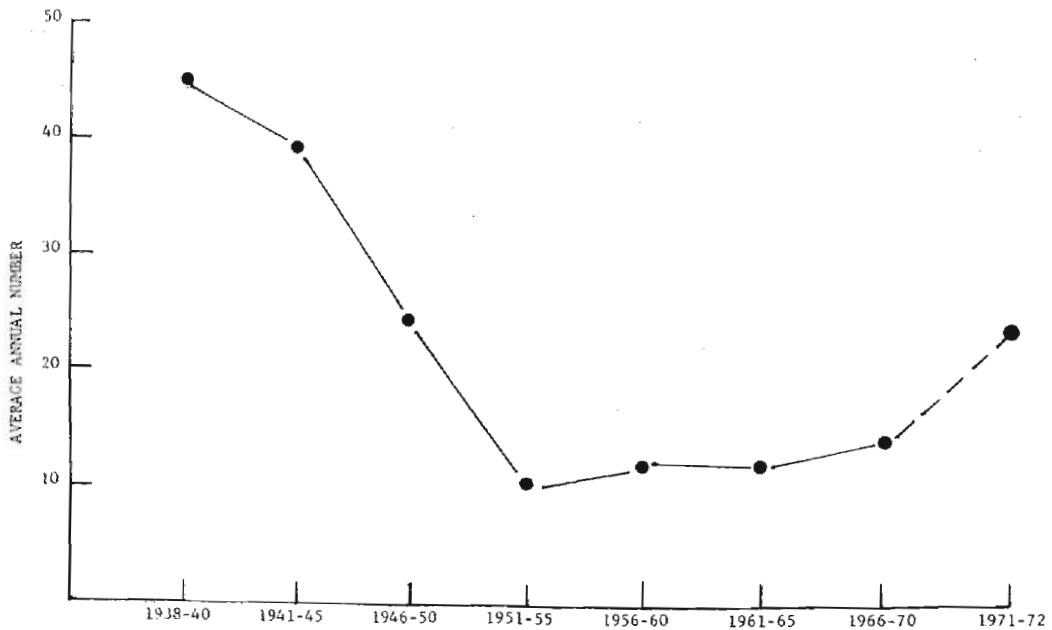


Table 2 records the number of outbreaks and cases by etiology and type of water system. Twenty-two (47%) outbreaks with 5,615 (82%) cases are grouped under the category of gastroenteritis. These include outbreaks characterized by nausea, vomiting, diarrhea, and fever for which no specific etiologic agent could be identified. Illness described as "sewage poisoning" is included in this category. Infectious hepatitis (23%) and S. sonnei (13%) were the most commonly identified etiologies of outbreaks.

The data in Table 2 indicate that outbreaks most commonly involved semi-public systems (59%) compared with municipal (30%) and individual (11%) water systems. However, outbreaks attributed to water from municipal systems affected an average of 310 persons (4,333/14) compared with 88 (2,465/28) persons in outbreaks caused by water from semi-public systems, and 4 (19/5) persons in outbreaks attributed to water from individual systems. Although semi-public systems were responsible for 60% of reported outbreaks, municipal systems caused almost 2 out of 3 reported cases.

Table 2

Waterborne Disease Outbreaks, by Etiology and Type of Water System

	<u>Municipal</u>		<u>Semi-Public</u>		<u>Individual</u>		<u>Total</u>	
	<u>Outbreaks</u>	<u>Cases</u>	<u>Outbreaks</u>	<u>Cases</u>	<u>Outbreaks</u>	<u>Cases</u>		
Gastroenteritis	8	4,025	14	1,590	-	-	22	5,615
Infectious hepatitis	4	80	4	175	3	11	11	266
<u>S. sonnei</u>	1	187	5	427	-	-	6	614
Giardiasis	-	-	3	112	-	-	3	112
Chemical poisoning	1	41	2	161	-	-	3	202
Salmonellosis	-	-	-	-	1	3	1	3
Typhoid	-	-	-	-	1	5	1	5
Total	14	4,333	28	2,465	5	19	47	6,817

The distribution of all outbreaks by month is seen in Table 3. A seasonal variation is apparent with 32 (70%) of 46 outbreaks occurring between May and September.

Table 3

Waterborne Disease Outbreaks by Monthly Distribution, 1971-1972

<u>Month</u>	<u>Number of outbreaks</u>	<u>Month</u>	<u>Number of outbreaks</u>
January	0	July	6
February	0	August	5
March	2	September	6
April	3	October	1
May	8	November	7
June	7	December	1
Total		46*	

*1 unknown month

Additional analysis of the 33 outbreaks associated with the semi-public and individual water supplies (Table 4) indicates that 24 (73%) of them occurred in visitors to areas used mostly for recreational purposes and that 21 (88%) of the 24 occurred in spring and summer.

Table 4

Waterborne Outbreaks in Semi-public and Individual Water Supplies by Month and Population

	Number of outbreaks	(1) Usual population	(2) Schools	(3) Visitors*
January	0			
February	0			
March	1			1
April	2			3
May	7*	3		5
June	5*	1	1	4
July	3			3
August	4	1		3
September	4	1		3
October	1		1	
November	4	2	1	1
December	1			1
Total	33	8	3	24

- (1) Outbreaks among individuals normally using water supply
- (2) Outbreaks in schools or institutions
- (3) Outbreaks among individuals who do not use supplies on regular basis, e.g., travelers, campers, restaurant patrons, etc.

* One outbreak in May and one in June involved visitors and usual population.

Table 5 classifies outbreaks and cases by type of water system and cause of outbreak. Untreated ground or surface water (49%) and treatment deficiencies (30%), including inadequate chlorination and breakdown in chlorination equipment, were the factors most often associated with outbreaks. In municipal systems deficiencies in the distribution system were also responsible for causing outbreaks. Treatment deficiencies were responsible for most of the cases involving municipal system (mostly 1 outbreak), while untreated ground water was responsible for most cases in semi-public systems.

Table 5

Waterborne Outbreaks by Type of System and Cause of System Deficiency
1971 - 1972

	<u>Municipal</u>		<u>Semi-Public</u>		<u>Individual</u>		<u>Total</u>	
	<u>Outbreaks</u>	<u>Cases</u>	<u>Outbreaks</u>	<u>Cases</u>	<u>Outbreaks</u>	<u>Cases</u>	<u>Outbreaks</u>	<u>Cases</u>
Untreated surface water	1	400	1	84	1	3	3	487
Untreated ground water	3	62	13	1621	4	16	20	1699
Treatment deficiencies*	4	3613	10	479	0	0	14	4092
Deficiencies in the distribution system	5	255	0	0	0	0	5	255
Miscellaneous**	1	3	4	281	0	0	5	284
Total	14	4333	28	2465	5	19	47	6817

* Includes outbreaks in systems using a known contaminated source for which chlorination is required at all times to insure potability.

** Includes use of water not intended for drinking or outbreaks where data insufficient to define problem with water handling.

E. WATERBORNE DISEASE OUTBREAKS
1971-1972

ALABAMA

<u>City--County</u>	<u>Month-Year</u>	<u>Disease or Organism</u>	<u>Cases</u>
Colbert County	Oct-Nov 72	infectious hepatitis	50
Jefferson County	Aug-Sep 72	infectious hepatitis	9

ALASKA

Anchorage	Nov 71	<u>S. sonnei</u>	89
Cordova	Mar 72	gastroenteritis	400

ARKANSAS

Wickes, Polk County	Jun-Sep 71	infectious hepatitis	98
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CALIFORNIA

Pico Rivera	Jul-Aug 71	gastroenteritis	3,500
Ski Lodge	Dec 71 Jan 72	gastroenteritis (sewage poisoning)	84
Lake Comanche	May-Jun 72	gastroenteritis (sewage poisoning)	26+

COLORADO

Boulder County	Apr 72	gastroenteritis	142
Boulder County	May 72	<u>Giardia lamblia</u>	28
Winter Park	May 72	<u>Giardia lamblia</u>	24
Rocky Ridge Basin	Apr 72	gastroenteritis	25

FLORIDA

Nokomis	May 72	gastroenteritis	40
Mascotte	Nov 72	chemical poisoning	41

HAWAII

Molokai	Sep 72	<u>S. sonnei</u>	61
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<u>City--County</u>	<u>Month-Year</u>	<u>Disease or Organism</u>	<u>Cases</u>
<u>ILLINOIS</u>			
Grafton	May 72	gastroenteritis	90
<u>INDIANA</u>			
Washington County	Apr 72	<u>S. sonnei</u>	2
<u>IOWA</u>			
Stockport	Nov 72	<u>S. sonnei</u>	208
<u>KENTUCKY</u>			
Greenbo Lake State Park	Jul 71	gastroenteritis	68
<u>MARYLAND</u>			
Cecil County	Jun 72	gastroenteritis (sewage poisoning)	88
<u>MASSACHUSETTS</u>			
Medford	Jun 72	gastroenteritis	3
<u>MINNESOTA</u>			
Perham	May-Jun 72	chemical poisoning	11
<u>MISSISSIPPI</u>			
Bay St. Louis	Jul 71	<u>S. sonnei</u>	187
<u>MISSOURI</u>			
Pacific	71	gastroenteritis	2
<u>NEW JERSEY</u>			
Vernon	Jul-Aug 71	infectious hepatitis	22
Warren County	Aug 71	<u>S. sonnei</u>	67
<u>NEW MEXICO</u>			
Roswell	Aug 71	gastroenteritis	10

<u>City--County</u>	<u>Month-Year</u>	<u>Disease or Organism</u>	<u>Cases</u>
<u>NEW YORK</u>			
Upstate New York	Nov 71	gastroenteritis	500-1,000
Upstate New York	Mar 72	gastroenteritis	21
<u>NORTH CAROLINA</u>			
Camp LeJeune	Sep-Nov 71	gastroenteritis	38
Gaston County	Sep 71-May 72	infectious hepatitis	2
Asheboro	Aug 72	gastroenteritis (sewage poisoning) -	9+
<u>OHIO</u>			
Shelby County	May 72	infectious hepatitis	9
Summit County	Jul-Sep 72	infectious hepatitis	12
<u>OKLAHOMA</u>			
Locust Grove	Nov-Dec 71	infectious hepatitis	50
Oklahoma City	Aug 71	infectious hepatitis	6
<u>OREGON</u>			
Restaurant, motel, service station	Jun 71	gastroenteritis	200+
Troy	May-Jun 72	gastroenteritis	37
<u>PENNSYLVANIA</u>			
School	Jun 72	chemical poisoning	150
Neffs	Jul 72	infectious hepatitis	5
<u>TENNESSEE</u>			
Franklin	Sep 72	gastroenteritis	19
<u>TEXAS</u>			
St. Lawrence	Nov 71	infectious hepatitis	3
<u>UTAH</u>			
San Juan	Sep 72	giardiasis	60

<u>City--County</u>	<u>Month-Year</u>	<u>Disease or Organism</u>	<u>Cases</u>
<u>VERMONT</u>			
Bradfort	Jun 71	gastroenteritis	3
<u>WASHINGTON</u>			
Yakima	Jun-Jul 72	typhoid	5
Roslyn	Sep 72	salmonellosis	3
<u>WEST VIRGINIA</u>			
Chelyon, Kanawha County	Nov 72	gastroenteritis	60+

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VI. ARTICLES IN MMWR ON FOODBORNE AND WATERBORNE DISEASES DURING 1972

Bacillus cereus

*Possible B. cereus Infection - Wisconsin 22(2):14

Brucellosis

**Brucellosis - Illinois 21(22):186

**Brucellosis - United States, 1971 21(46):393

C. botulinum

**Botulism - California 21(13):106

Possible Botulism - Northwestern Ohio 21(24):205

* Foodborne Botulism - United States, 1971-1972 22(7):62

* Probable Botulism - Oklahoma 22(8):71

C. perfringens

C. perfringens - Washington 21(19):163

* C. perfringens Gastroenteritis - Washington 22(1):3

Salmonella

S. montevideo - Arkansas 21(38):327

S. montevideo in a Commercial Dietary Supplement - Texas 21(42):338

S. typhimurium - Minnesota, Wisconsin, Michigan 21(48):411

* Foodborne S. newport Outbreak - Texas 22(2):13

* S. agona - Arkansas 22(4):29

* Head Cheese Associated Salmonellosis - New Jersey 22(5):43

Staphylococcus

Staphylococcal Food Poisoning - New York 21(17):146

Staphylococcal Food Poisoning - Tennessee 21(20):169

Presumptive Staphylococcal Food Poisoning - Arkansas 21(31):262

Staphylococcal Food Poisoning - Kentucky 21(31):263

Staphylococcal Food Poisoning - Oregon 21(38):332

Staphylococcal Food Poisoning - Wisconsin 21(49):422

Vibrio parahaemolyticus

V. parahaemolyticus Gastroenteritis - United Kingdom 21(12):99

V. parahaemolyticus Gastroenteritis - Maryland 21(29):245

Presumed V. parahaemolyticus Gastroenteritis - Hawaii 21(33):282

V. parahaemolyticus - Louisiana 21(40):341

V. parahaemolyticus - New Jersey 21(50):430

Trichinella spiralis

**Trichinosis - United States 21(1):1

Trichinosis - Missouri 21(28):329

**Trichinosis - United States, 1971 21(32):273

Hepatitis

**Shellfish-Associated Hepatitis - Massachusetts 21(2):20

* Common Source Outbreak of Hepatitis A 22(10):86

Fish Poisoning

- Probable Scombroid Fish Poisoning - Vermont 21(31):261
Probable Ciguatera Poisoning - Alabama 21(37):313
Paralytic Shellfish Poisoning Associated with Red Tide - New England 21(38):324
and 21(39):340
* Possible Scombroid Fish Poisoning - California 22(2):14

Chemical Poisoning

- Amanita Virosa Mushroom Poisoning - Ohio 21(42):359
Sodium Nitrite Poisoning - Thailand 21(48):416

Waterborne Disease

- **Gastroenteritis - Alaska (S. sonnei) 21(6):49
**Gastroenteritis - New York 21(14):115
Gastroenteritis - Illinois 21(23):198
Typhoid Fever - Alabama 21(32):280
Hepatitis - Alabama 21(31):439

Gastroenteritis

- **Gastroenteritis - Florida 21(1):6
Monkey Associated Gastroenteritis - Washington 21(35):299

- * Information reported in 1973 that pertains to data in 1972
**Information reported in 1972 that pertains to data in 1971