

BACTERIA IN OUR BAYOUS: IS IT A HEALTH PROBLEM ?

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Harris County

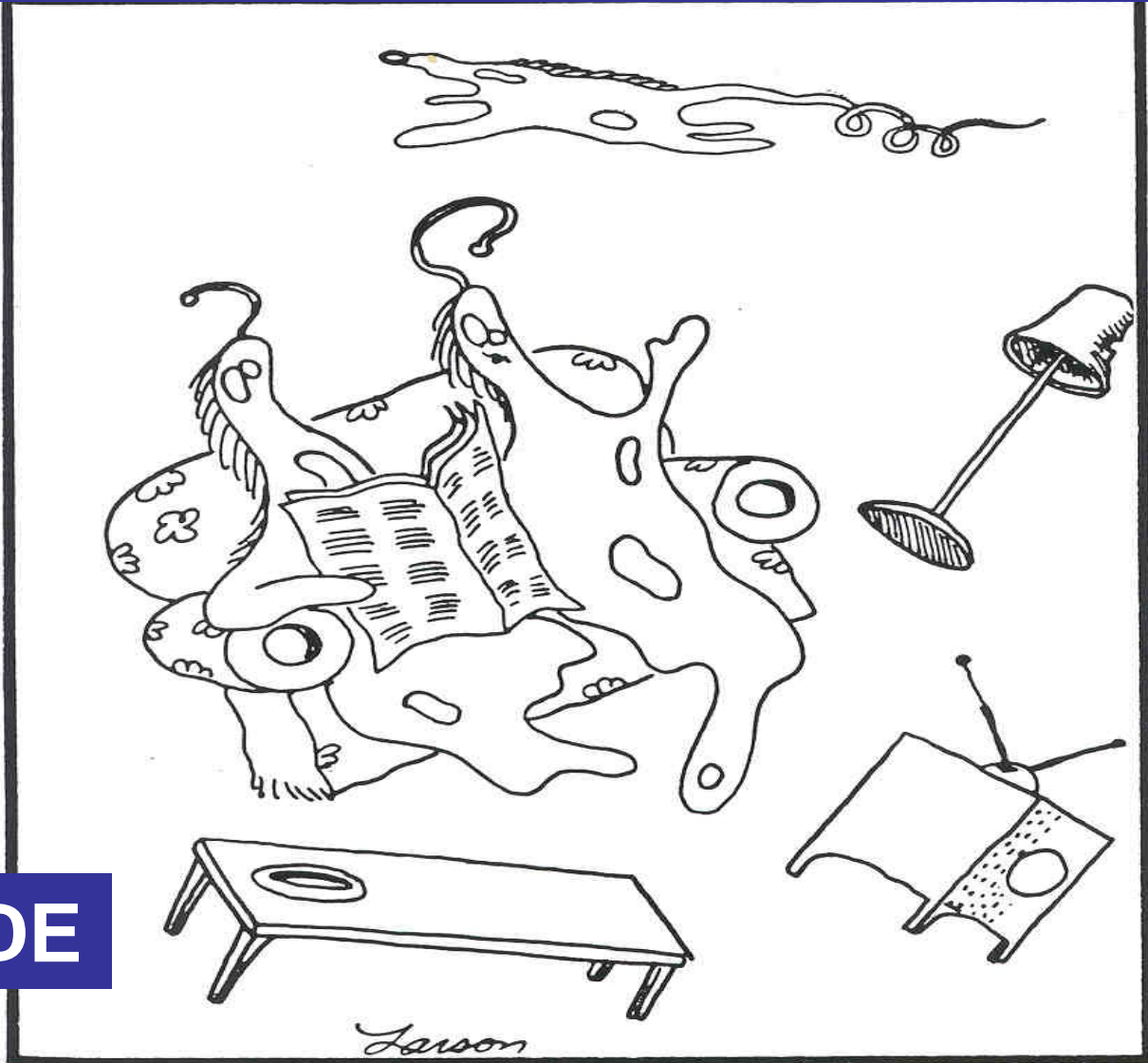
HCPHES

Public Health & Environmental Services

Waterborne Disease

- Recreational water settings
 - Untreated
 - Fresh and marine bodies of water
 - Lakes, rivers, beaches, etc.
 - Treated
 - Swimming pools, wading pools, spas
 - Water parks, interactive fountains, etc.
- Other water exposures
 - Grocery store misters
 - Water cooled air conditioning systems

WELL.....



FAR SIDE

Things that live in a drop of water, and some of their furniture.

There's more than bacteria out there

- Bacteria
- Viruses
- Protozoa
- Toxic Algae
- Helminths
- Chemicals

Waterborne Diseases Associated with Fresh and Marine Bodies of Water

- Fecal contamination
- Free living organisms

Waterborne Disease Outbreaks (WBDOs)

Recreational Waterborne Illness (RWI)

Recognition of Illness and Outbreaks

- True burden of disease may not be known
 - Not all infected persons are symptomatic
 - Those who are don't always go to Dr.
 - Dr. doesn't always run tests
 - Most labs don't test for agents without specific request
 - Positive results are not always reported to public health

Bacteria

- Fecal contamination
 - *Shigella sp.*
 - *Salmonella sp.* (including typhoid)
 - *Vibrio cholerae*
 - *E. coli O157:H7* and others
 - (EHEC, ETEC, EIEC, EPEC, ...)
 - *Campylobacter sp.*
 - *Leptospira* serovars (urine)

Bacteria

- Free living organisms
 - *Pseudomonas aeruginosa*
 - *Plesioimonas shigelloides*
 - Non-cholera *Vibrio sp.*

Viruses

- Fecal contamination
 - Polio
 - Hepatitis A & E
 - Enteroviruses
 - Coxsackie, Echovirus and Newer Enteroviruses
 - Caliciviruses
 - Norovirus and Newer Caliciviruses

Protozoa

- Fecal contamination
 - *Entamoeba histolytica* (amebiasis)
 - *Giardia lamblia* (giardiasis)
 - *Cryptosporidium*
 - *Cyclospora*
- Free living organisms
 - *Nagleria fowleri* (PAM)
 - *Acanthamoeba* sp. (keratitis)

Toxic Algae

Harmful Algal Blooms

- Free living organisms
 - *Pfiesteria piscicida* - Pfiesteria associated syndrome
 - *Karenia brevis* (*Gymnodinium breve*) - “Red tide” and Neurotoxic shellfish poisoning
 - *Alexandrium spp.* - Paralytic shellfish poisoning
 - *Gambierdiscus toxicus* - Ciguatera fish poisoning
 - *Dinophysis spp.* - Diarrhetic shellfish poisoning
 - *Pseudo-nitzschia spp.* - Amnesic shellfish poisoning

Helminths

- Fecal contamination
 - *Dracunculus medinensis* – Guinea worm disease
 - *Shistosoma spp.* – Shistosomiasis
 - Tapeworm infections
 - *Taenia spp.*
 - *Echinococcus spp.*
 - *Hymenolepis nana*

Chemicals

- Muriatic acid
- Algaecides
- Chloramines
- Unknown substances



MMWRTM

Morbidity and Mortality Weekly Report

Surveillance Summaries

October 22, 2004 / Vol. 53 / No. SS-8

**Surveillance for Waterborne-Disease
Outbreaks Associated with Recreational Water —
United States, 2001–2002**

and

**Surveillance for Waterborne-Disease
Outbreaks Associated with Drinking Water —
United States, 2001–2002**

TABLE 7. Waterborne-disease outbreaks (n = 65) associated with recreational water, by etiologic agent and type of water — United States, 2001–2002

Etiologic agent	Type				Total	
	Treated		Fresh			
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Bacterial	24	571	3	69	27	640
<i>Pseudomonas aeruginosa</i>	18*	393	0	0	18	393
<i>Escherichia coli</i> (O157:H7, O26:NM)	1	9	3†	69	4	78
<i>Shigella sonnei</i>	2	78	0	0	2	78
<i>Bacillus</i> species	1	20	0	0	1	20
<i>Legionella</i> species	1	68	0	0	1	68
<i>Staphylococcus</i> species	1	2	0	0	1	2
Parasitic	9	1,469	12	34	21	1,503
<i>Cryptosporidium</i> species	9	1,469	2	5	11	1474
<i>Naegleria fowleri</i>	0	0	8	8	8	8
<i>Giardia intestinalis</i>	0	0	1	2	1	2
Avian schistosomes	0	0	1*	19	1	19
Unknown	5	63	3	82	8	145
AGI§	4	59	3	82	7	141
ARI¶	1	4	0	0	1	4
Viruses	2	51	3†	95	5	146
Norovirus	2	51	3†	95	5	146
Chemical	4	102	0	0	4	102
Chlorine gas	2	50	0	0	2	50
Chloramines	2*	52	0	0	2	52
Total	44	2,256	21	280	65	2,536
Percentage	(67.7)	(89.0)	(32.3)	(11.0)	(100)	(100)

* Includes outbreaks of suspected etiology on the basis of clinical syndrome and setting.

† Includes one mixed-pathogen outbreak.

§ Acute gastrointestinal illness of unknown etiology.

¶ Acute respiratory illness of unknown etiology.

TABLE 5. Waterborne-disease outbreaks of meningococcal meningitis, acute respiratory infection, and Pontiac fever (n = 10) associated with recreational water — United States, 2001–2002

State	Year	Month	Class*	Etiologic agent	Illness	No. of cases (n = 80)	Source	Setting
Florida	2002	Jul	NA†	<i>Naegleria fowleri</i>	Meningococcal meningitis	1	Lake	Park
Florida	2002	Jul	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake
Georgia	2002	Aug	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	River	River
Georgia	2002	Jun	IV	ARI§	Acute respiratory	4	Spa	Private residence
Illinois	2002	Aug	I	<i>Legionella</i> species¶**	Pontiac fever	68	Spa	Hotel/motel
Oklahoma	2001	Jun	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake
Texas	2001	Aug	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake
Texas	2001	Aug	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake
Texas	2001	Aug	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake
Texas	2002	Aug	NA	<i>N. fowleri</i>	Meningococcal meningitis	1	Lake	Lake

* On the basis of epidemiologic and water-quality data provided on CDC form 52.12.

† Not applicable.

§ Acute respiratory infection of unknown etiology; *Legionella* species suspected.

¶ Also listed in Table 2 in Blackburn B, Craun GF, Yoder JS, et al. Surveillance for waterborne-disease outbreaks associated with drinking water—United States, 2001–2002. In: Surveillance Summaries (October 22, 2004). MMWR 2004;53(No. SS-8):23–45 but only counted in statistics pertaining to this summary.

** The spa filter was positive for *Legionella dumoffii*.

TABLE 2. Waterborne-disease outbreaks of gastroenteritis (n = 12) associated with recreational water — United States, 2001

State	Month	Class*	Etiologic agent	No. of cases		Setting
				(n = 782)	Source	
Colorado	Jul	III	<i>Shigella sonnei</i>	33	Interactive fountain	Community
Iowa	Jun	I	<i>S. sonnei</i>	45	Wading pool	Public park
Illinois	Jul	I	<i>Cryptosporidium hominis</i> †	358	Pool	Waterpark
Minnesota	Jul	III	<i>Escherichia coli</i> O157:H7§	20	Lake	Public beach
Minnesota	Jul	IV	Norovirus	40	Lake	Public beach
Minnesota	Aug	IV	<i>E. coli</i> O26:NM	4	Lake	Community park
Nebraska	Jul	IV	<i>Cryptosporidium</i> species	157	Pools	Community
Nebraska	Jul	IV	<i>Cryptosporidium</i> species	21	Pool	Community
New Hampshire	Aug	III	AGI¶**	42	Lake	State park
Oregon	May	IV	AGI	15	Pool	Lodge
South Carolina	Jul	I	<i>E. coli</i> O157:H7	45	Lake	State park
Wyoming	Aug	III	<i>Cryptosporidium</i> species	2	Flow-through pool/hot spring††	State park

* On the basis of epidemiologic and water-quality data provided on CDC form 52.12.

† The species of *Cryptosporidium* that infects humans and monkeys (Source: Xiao L, Fayer R, Ryan U, Upton SJ. *Cryptosporidium* taxonomy: recent advances and implications for public health. Clin Microbiol Rev 2004;17:72–97).

§ Counted as an *E. coli* O157:H7 outbreak in all statistics. Ten persons had stool specimens that tested positive for *E. coli* O157:H7, and one person had a stool specimen that tested positive for *Campylobacter jejuni*.

¶ Acute gastrointestinal illness of unknown etiology.

** *Oscillatoria* was isolated from the lake water in high concentrations, which is consistent with clinical symptoms.

†† Counted as freshwater venue in statistics.

TABLE 3. Waterborne-disease outbreaks of gastroenteritis (n = 18) associated with recreational water — United States, 2002

State	Month	Class*	Etiologic agent	No. of cases (n = 1,137)	Source	Setting
Florida	Jul	I	AGI†	7	Lake	Public beach
Florida	Oct	III	AGI	3	Pool	Apartment complex
Georgia	Jul	III	<i>Cryptosporidium</i> species	3	Wading pool	Child care center
Maine	Jul	IV	<i>Escherichia coli</i> O157:H7	9	Wading pool	Private home
Maine	Nov	III	AGI	33	Puddle	School
Massachusetts	Jul	II	<i>Cryptosporidium</i> species	767	Pool	Membership sport club
Michigan	Dec	IV	AGI	32	Pool	Hotel/motel
Minnesota	Jun	IV	Norovirus	11	Lake	Public beach
Minnesota	Mar	II	Norovirus	36	Pool	Hotel/motel
Minnesota	Jul	II	<i>Cryptosporidium</i> species	52	Indoor pool	Health club
Minnesota	Aug	II	<i>Cryptosporidium</i> species	41	Pool	Hotel/motel
Minnesota	Aug	II	<i>Cryptosporidium</i> species	16	Pool	Resort
Oregon	Aug	II	AGI	9	Pool	Apartment complex
Texas	Aug	IV	<i>Cryptosporidium hominis</i> §	54	Wading pool	Hotel/motel
Wisconsin	Mar	IV	Norovirus	15	Pool	Hotel/motel
Wisconsin	Jul	III	Norovirus¶	44	Lake	State park
Wyoming	May	IV	<i>Cryptosporidium</i> species	3	Lake	Lake
Wyoming	Jul	IV	<i>Giardia intestinalis</i>	2	River	River

* On the basis of epidemiologic and water-quality data provided on CDC form 52.12.

† Acute gastrointestinal illness of unknown etiology.

§ The species of *Cryptosporidium* that infects humans and monkeys (Source: Xiao L, Fayer R, Ryan U, Upton SJ. *Cryptosporidium* taxonomy: recent advances and implications for public health. Clin Microbiol Rev 2004;17:72–97).

¶ Counted as a norovirus outbreak in all statistics. Two persons with primary cases had stool specimens tested; one person had a stool specimen that tested positive for norovirus, and one person had a stool specimen that tested positive for *Cryptosporidium*. Stool specimens from two persons with secondary cases were tested; one person had a stool specimen that tested positive for norovirus, and one person had a stool specimen that tested positive for *Shigella sonnei*. Illness in persons with primary cases was most consistent with norovirus infection.

TABLE 4. Waterborne-disease outbreaks of dermatitis (n = 21) associated with recreational water — United States, 2001–2002

State	Year	Month	Etiologic agent	No. of cases (n = 435)	Source	Setting
Alaska	2002	Feb	<i>Pseudomonas aeruginosa</i> [†]	110	Pool/spa	Hotel/motel
Alaska	2002	Feb	<i>P. aeruginosa</i> [§]	3	Pool/spa	Hotel/motel
Colorado	2002	May	<i>P. aeruginosa</i> [†]	12	Pool/spa	Hotel/motel
Florida	2001	Mar	<i>P. aeruginosa</i> [§]	34	Pool	Hotel/motel
Florida	2001	Mar	<i>P. aeruginosa</i> [†]	53	Spa	Hotel/motel
Florida	2001	Apr	<i>P. aeruginosa</i> [§]	7	Spa	Apartment complex
Iowa	2002	Mar	<i>P. aeruginosa</i> [§]	24	Pool/spa	Hotel/motel
Maine	2001	Feb	<i>P. aeruginosa</i> [§]	21	Spa	Hotel/motel
Maryland	2001	Nov	<i>P. aeruginosa</i> [§]	8	Spa	Private residence
Maryland	2002	Feb	<i>P. aeruginosa</i> [§]	3	Spa	Membership club
Minnesota	2001	May	<i>P. aeruginosa</i> ^{*†}	6	Spa	Resort
Nebraska	2001	Mar	<i>P. aeruginosa</i> [§]	9	Pool/spa	Hotel/motel
Ohio	2002	Feb	<i>P. aeruginosa</i> [†]	18	Spa	Hotel/motel
Ohio	2002	Mar	<i>P. aeruginosa</i> ^{*†}	31	Pool/spa	Hotel/motel
Oregon	2002	Jul	Avian schistosomes [§]	19	Lake	Lake
Pennsylvania	2001	May	<i>P. aeruginosa</i> [†]	2	Spa	Hotel/motel
Pennsylvania	2001	May	<i>P. aeruginosa</i> [§]	42	Spa	Hotel/motel
Pennsylvania	2001	May	<i>Bacillus</i> species [†]	20	Spa	Hotel/motel
Pennsylvania	2001	Jun	<i>Staphylococcus</i> species [§]	3	Spa	Hotel/motel
Washington	2001	Aug	<i>P. aeruginosa</i> [†]	3	Spa	Hotel/motel
Wisconsin	2001	Nov	<i>P. aeruginosa</i> [§]	7	Spa	Hotel/motel

* Laboratory-confirmed case.

† Organism isolated from water.

§ Suspected etiology on the basis of clinical syndrome and setting.

TABLE 6. Waterborne-disease outbreaks involving chemical exposures* (n = 4) associated with recreational water — United States, 2001–2002

State	Year	Month	Etiologic agent	Illness	No. of cases (n = 102)	Source	Setting
Alaska	2002	Sep	Chlorine gas	Acute respiratory	30	Pool	University
Ohio	2002	Jun	Chlorine gas	Acute respiratory	20	Wave pool	Waterpark
West Virginia	2002	Oct	Chloramines†	Acute respiratory	32	Indoor pool	Hotel/motel
Wisconsin	2001	Sep	Chloramines†	Acute respiratory	20	Indoor pool	School

* On the basis of epidemiologic and water-quality data provided on CDC form 52.12.

† Suspected etiology on the basis of clinical syndrome and setting.



MMWRTM

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Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water — United States, 2003–2004

and

Surveillance for Waterborne Disease and Outbreaks Associated with Drinking Water and Water not Intended for Drinking — United States, 2003–2004

TABLE 7. Number of waterborne-disease outbreaks (n = 62) associated with recreational water, by etiologic agent(s) and type of water — United States, 2003–2004

Etiologic agent	Type				Total	
	Treated		Untreated		No. of outbreaks (%)	No. of cases (%)
	No. of outbreaks	No. of cases	No. of outbreaks	No. of cases		
Bacteria	14	457	6	96	20 (32.3)	553 (20.5)
<i>Legionella pneumophila</i>	4	117	0	0	4	117
<i>Leptospira</i> species	0	0	1	3	1	3
MRSA*	1	10	0	0	1	10
<i>Plesiomonas shigelloides</i>	0	0	2	5	2	5
<i>Pseudomonas</i> species	8	274	0	0	8	274
<i>Shigella</i> species	1	56	2	23	3	79
<i>Shigella</i> and <i>Plesiomonas</i> species	0	0	1	65	1	65
Parasites	12	1,414	3	14	15 (24.2)	1,428 (52.9)
<i>Cryptosporidium</i> species	10	1,202	1	4	11	1,206
<i>Giardia</i> species	1	149	1	9	2	158
<i>Naegleria fowleri</i>	0	0	1	1	1	1
<i>Cryptosporidium</i> and <i>Giardia</i> species	1	63	0	0	1	63
Viruses	4	288	2	48	6 (9.7)	336 (12.5)
Echovirus 9	1	36	0	0	1	36
Norovirus	3	252	2	48	5	300
Chemicals/toxins	1	3	2	22	3 (4.8)	25 (0.9)
Microcystin toxin (blue-green algae)	0	0	2	22	2	22
Muriatic acid	1	3	0	0	1	3
Unidentified agent	12	284	6	72	18 (29.0)	356 (13.2)
Suspected chemicals†	1	17	0	0	1	17
Suspected chloramines	6	157	0	0	6	157
Suspected algaecide	1	9	0	0	1	9
Suspected norovirus	0	0	3	48	3	48
Suspected <i>Pseudomonas</i> species	2	32	0	0	2	32
Suspected schistosomes	0	0	2	15	2	15
Other unidentified	2	69	1	9	3	78
Total (%)	43 (69.4)	2,446 (90.7)	19 (30.6)	252 (9.3)	62 (100.0)	2,698 (100.0)

*Methicillin-resistant *Staphylococcus aureus*.

†Suspected psychogenic factors and chemical exposure.

TABLE 2. Waterborne-disease outbreaks (n = 18) associated with treated recreational water, by state — United States, 2003

State	Month	Class*	Etiologic agent	Predominant illness†	No. of cases (n = 1,141)	Type	Setting
Arkansas	Aug	IV	<i>Cryptosporidium</i>	AGI†	4	Pool	Large facility
Connecticut	Jul	I	Echovirus 9	Neuro†	36	Pool	RV§ campground
Connecticut	Aug	I	MRSA¶	Skin†	10	Spa	Athletic center
Georgia	Apr	IV	Unidentified	Skin	5	Spa	Hotel
Illinois	Jan	I	<i>Pseudomonas aeruginosa</i>	Skin	52	Spa	Hotel
Illinois	Dec	I	Unidentified**	AGI	12	Pool	Hotel
Iowa	Jun	IV	<i>Cryptosporidium</i> and <i>Giardia intestinalis</i> ††	AGI	63	Wading pool	Day care center
Kansas	Jul	I	<i>C. hominis</i> §§	AGI	617	Pools, Wading pools	Community
Massachusetts	Jun	II	<i>G. intestinalis</i>	AGI	149	Pool	Membership club
Michigan	Feb	II	Unidentified¶¶	Skin	25	Spa	Hotel
New Mexico	Jun	III	<i>Legionella pneumophila</i> serogroup 1	ARI†	4	Spa	Hotel
New York	Mar	III	Muriatic (hydrochloric) acid	ARI	3	Pool	Membership club
New York	Nov	IV	Unidentified¶¶	Skin	7	Pool	Membership club
Ohio	Jan	I	<i>P. aeruginosa</i>	Skin	17	Pool, spa	Hotel
Oregon	Jul	I	<i>Shigella sonnei</i>	AGI	56	Interactive fountain	Community
South Carolina	Nov	II	Unidentified	Skin	64	Spa, pool	Hotel
Wisconsin	Feb	I	<i>L. pneumophila</i> serogroup 1	ARI	3	Spa	Hotel
Wisconsin	Jul	II	<i>Cryptosporidium</i>	AGI	14	Wading pool	Community

* On the basis of epidemiologic and water-quality data provided on GDC form 52.12 (available at http://www.cdc.gov/healthyswimming/downloads/cdc_5212_waterborne.pdf).

† AGI: acute gastrointestinal illness; Neuro: neurologic condition or symptoms (e.g., meningoencephalitis or meningitis); Skin: illness, condition, or symptom related to skin; and ARI: acute respiratory illness.

§ RV: recreational vehicle.

¶ MRSA: Methicillin-resistant *Staphylococcus aureus*.

** Etiology unidentified; chemical contamination from pool disinfection by-products (e.g., chloramines) suspected.

†† Each pathogen was identified in ≥5% of positive clinical specimens; therefore, both are listed as etiologic agents.

§§ Species determined by using molecular technology and current taxonomic guidelines (Source: Xiao L, Fayer R, Ryan U, Upton SJ. *Cryptosporidium* taxonomy: recent advances and implications for public health. *Clin Microbiol Rev* 2004;17:72–97).

¶¶ Etiology unidentified: *P. aeruginosa* suspected on the basis of clinical syndrome and setting.

TABLE 3. Waterborne-disease outbreaks (n = 25) associated with treated recreational water, by state — United States, 2004

State	Month	Class*	Etiologic agent	Predominant illness†	No. of cases (n = 1,305)	Type	Setting
California	Aug	I	<i>Cryptosporidium</i>	AGI†	336	Pool	Water park
Colorado	Aug	III	<i>Cryptosporidium</i>	AGI	6	Pool	Hotel
Florida	May	III	Norovirus	AGI	42	Waterslide	School
Georgia	Jan	IV	Unidentified§	Skin†	17	Pool	Hotel
Georgia	Jun	IV	<i>Cryptosporidium</i>	AGI	14	Pool	Community
Idaho	Mar	II	Norovirus	AGI	140	Pool	Community
Illinois	Jan	I	Unidentified¶	Eye†, ARI†	45	Pool	Hotel
Illinois	Jan	I	Unidentified¶	Eye, ARI	22	Pool, spa	Hotel
Illinois	Feb	III	<i>Pseudomonas aeruginosa</i>	Skin, ARI	16	Pool, spa	Hotel
Illinois	Feb	I	<i>P. aeruginosa</i>	Skin	5	Spa	Hotel
Illinois	Mar	I	Unidentified¶	Eye, ARI	57	Pool, spa	Hotel
Illinois	Jul	IV	Unidentified**	AGI	9	Pool	Community
Illinois	Jul	I	<i>Cryptosporidium</i>	AGI	37	Pool, wading pool, interactive fountain	Community
Illinois	Sep	I	<i>Cryptosporidium</i>	AGI	8	Pool	Hotel
New Mexico	Aug	IV	Unidentified¶	ARI	16	Pool	Membership club
New York	Dec	IV	Unidentified¶	ARI	5	Pool	Military facility
North Carolina	Mar	II	<i>P. aeruginosa</i>	Skin	41	Spa	Hotel
Ohio	Jul	I	<i>C. hominis</i> ††	AGI	160	Pool, wading pool	Community
Ohio	Jul	I	<i>P. aeruginosa</i>	Ear†, skin	119	Pool, spa	Resort
Ohio	Aug	I	<i>Legionella pneumophila</i> serogroup 1	ARI	3	Spa	Household
Oklahoma	Mar	I	<i>L. pneumophila</i> serogroup 1	ARI	107	Spa	Hotel
Oregon	Mar	III	<i>P. aeruginosa</i>	Skin	2	Spa	Motel
Vermont	Feb	I	Norovirus	AGI	70	Pool	Membership club
Wisconsin	Jun	I	<i>P. aeruginosa</i>	Skin, AGI	22	Pool, spa	Hotel
Wisconsin	Aug	IV	<i>Cryptosporidium</i>	AGI	6	Pool	Community

* On the basis of epidemiologic and water-quality data provided on GDG form 52.12 (available at http://www.cdc.gov/healthyswimming/downloads/cdc_5212_waterborne.pdf).

† AGI: acute gastrointestinal illness; Skin: illness, condition, or symptom related to skin; Eye: illness, condition, or symptom related to eyes; ARI: acute respiratory illness; and Ear: illness, condition, or symptom related to ears.

§ Etiology unidentified; psychogenic factors and chemical contamination suspected.

¶ Etiology unidentified; chemical contamination from pool disinfection by-products (e.g., chloramines) suspected.

** Etiology unidentified; chemical contamination with pool algacide suspected.

†† Although both *Cryptosporidium* oocysts and *Giardia* cysts were identified in the pool water, only *Cryptosporidium* oocysts were isolated from clinical specimens.

TABLE 4. Waterborne-disease outbreaks (n = 10) associated with untreated recreational water, by state — United States, 2003

State	Month	Class*	Etiologic agent	Predominant illness†	No. of cases (deaths) (n = 133)	Type	Setting
California	Jun	IV	Unidentified§	Skin†	9	Lake	Lake
Florida	Jul	II	Unidentified¶	AGI†	10	Lake	Lake
Florida	May	II	Unidentified¶	AGI	20	Lake	Camp
Georgia	May	I	<i>Shigella sonnei</i>	AGI	13	Lake	Park
Idaho	Jul	IV	<i>Cryptosporidium</i>	AGI	4	Lake	Lake
Maryland	Jul	III	<i>S. sonnei</i> & <i>Plesiomonas shigelloides</i> **	AGI	65	Lake	Park
North Carolina	Jul	IV	<i>Naegleria fowleri</i>	Neuro†	1 (1)	Lake	Lake
Ohio	Jul	IV	<i>P. shigelloides</i>	AGI	3	Lake	Bathing beach
Ohio	Jun	IV	Unidentified§	Skin	6	Lake	Private beach
Wyoming	Jul	IV	<i>P. shigelloides</i>	AGI	2	Reservoir	Reservoir

* On the basis of epidemiologic and water-quality data provided on GDC form 52.12 (available at http://www.cdc.gov/healthyswimming/downloads/cdc_5212_waterborne.pdf).

† Skin: illness, condition, or symptom related to skin; AGI: acute gastrointestinal illness; and Neuro: neurologic condition or symptoms (e.g., meningoen- cephalitis, meningitis).

§ Etiology unidentified; clinical diagnosis of cercarial dermatitis (caused by avian schistosomes).

¶ Etiology unidentified; illness was most consistent with norovirus infection.

** Each pathogen was identified in $\geq 5\%$ of positive clinical specimens; therefore, both are listed as etiologic agents.

TABLE 5. Waterborne-disease outbreaks (n = nine) associated with untreated recreational water, by state/territory — United States, 2004

State/Territory	Month	Class*	Etiologic agent	Predominant illness†	No. of cases (n = 119)	Type	Setting
Arkansas	Jun	IV	<i>Shigella flexneri</i>	AGI†	10	Lake	Swimming beach
Georgia	Aug	IV	Unidentified	Ear†	9	Lake	Lake
Guam	Apr	IV	<i>Leptospira</i> species	Leptospirosis	3	River	Waterfalls
Minnesota	Jun	IV	Norovirus	AGI	9	Lake	Swimming beach
Missouri	Mar	IV	<i>Giardia intestinalis</i>	AGI	9	Lake	Lake
Nebraska	Jul	III	Microcystin toxin (blue-green algae)	AGI, Skin†	20	Lake	Lake
Nebraska	Jul	III	Microcystin toxin (blue-green algae)	AGI, Skin	2	Lake	Lake
Oregon	Jul	IV	Norovirus	AGI	39	Lake	Swimming beach
Wisconsin	Jul	IV	Unidentified§	AGI	18	Lake	State park

* On the basis of epidemiologic and water-quality data provided on GDC form 52.12 (available at http://www.cdc.gov/healthyswimming/downloads/cdc_5212_waterborne.pdf).

† AGI: acute gastrointestinal illness; Ear: illness, condition, or symptom related to ears; and Skin: illness, condition, or symptom related to skin.

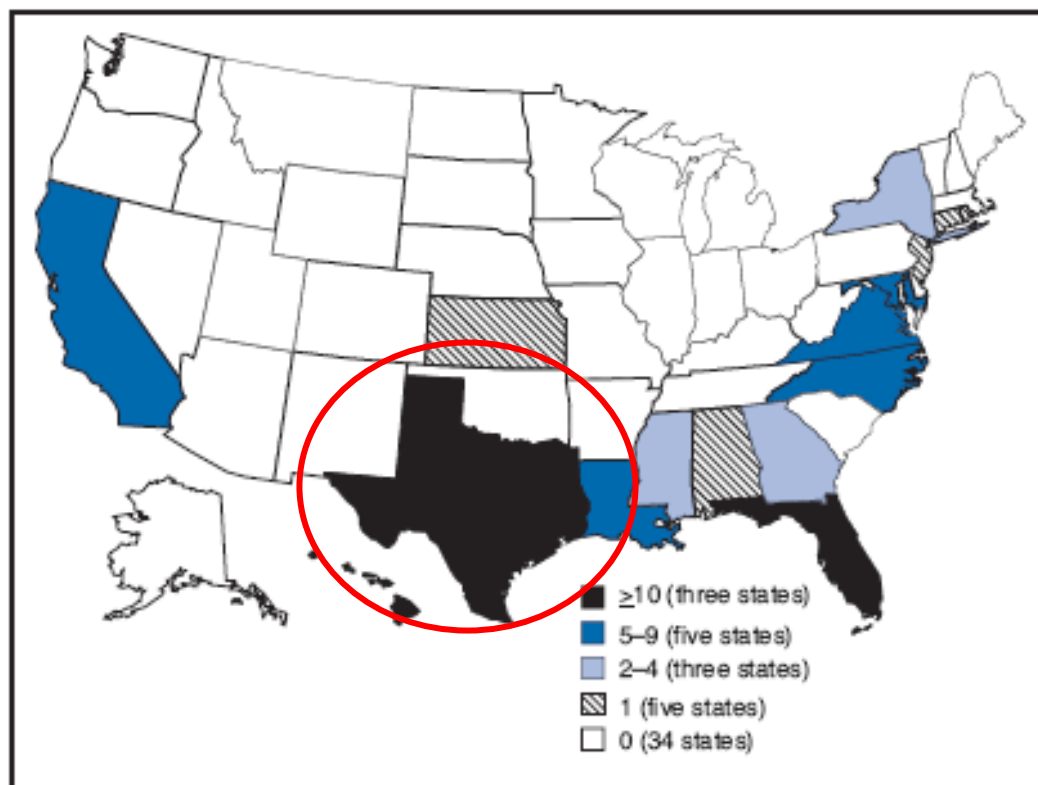
§ Etiology unidentified; illness was most consistent with norovirus infection.

TABLE 8. Number of illnesses associated with *Vibrio* isolation (n = 142) and recreational water exposure, by species and year — United States, 2003–2004

Species	Year						Total		
	2003			2004			Cases	Hospitalized	Deaths
	Cases	Hospitalized	Deaths	Cases	Hospitalized	Deaths			
<i>Vibrio alginolyticus</i>	24	4	1	19	4	0	43	8	1
<i>V. cholerae</i> non-O1, non-O139	3	0	0	4	2	1	7	2	1
<i>V. cholerae</i> , unknown type	0	0	0	1	0	0	1	0	0
<i>V. damsela</i>	1	0	0	1	1	0	2	1	0
<i>V. fluvialis</i>	1	1	0	0	0	0	1	1	0
<i>V. parahaemolyticus</i>	12	4	0	22	11	0	34	15	0
<i>V. vulnificus</i>	20	20	1	27	21	5	47	41	6
Multiple*	0	0	0	1	1	0	1	1	0
<i>Vibrio</i> , species not identified	2	0	0	4	1	1	6	1	1
Total (% of cases)	63	29 (46.0%)	2 (3.2%)	79	41 (51.9%)	7 (8.9%)	142	70 (49.3%)	9 (6.3%)
Percentage by year	(44.4)	(41.4)	(22.2)	(55.6)	(58.6)	(77.8)	(100.0)	(100.0)	(100.0)

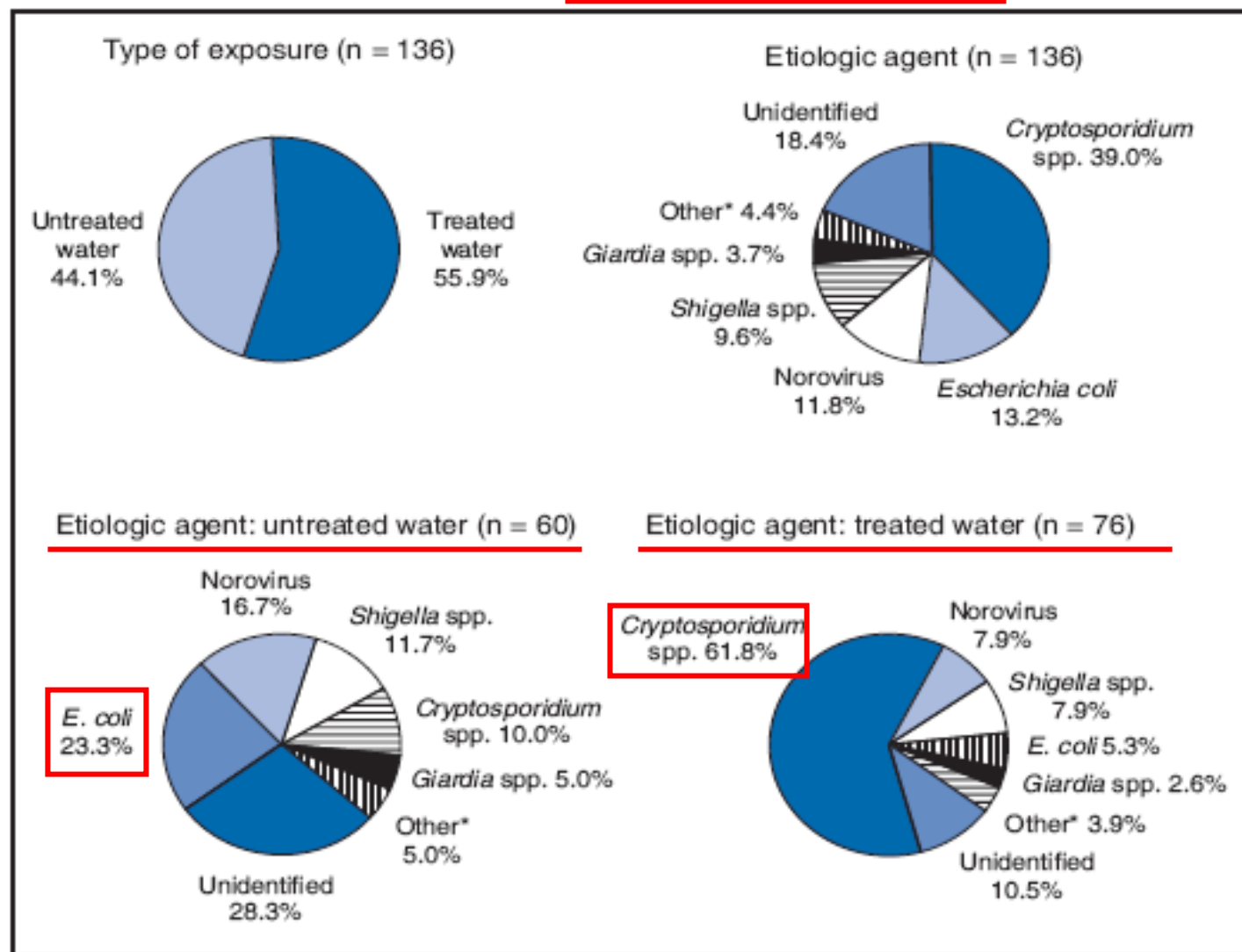
* *V. alginolyticus*/*V. parahaemolyticus* coinfection.

FIGURE 6. Number of illnesses associated with *Vibrio* isolation and recreational water exposure (n = 142) — United States, 2003–2004*



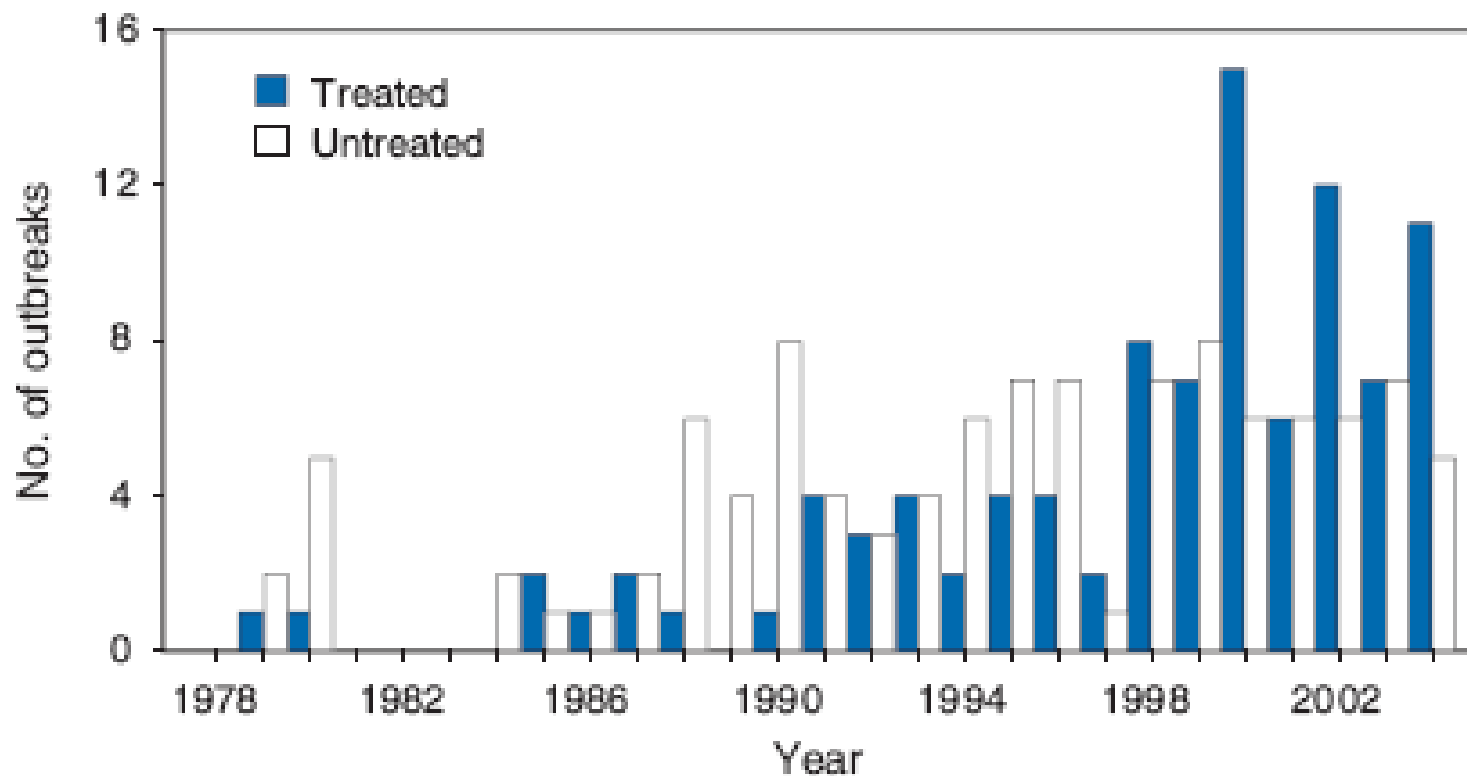
* **Note:** These numbers are largely dependent on reporting and surveillance activities in individual states and do not necessarily indicate the true incidence in a given state.

FIGURE 10 . Recreational water-associated outbreaks of gastroenteritis, by type of exposure and etiologic agent — United States, 1995–2004



* These include outbreaks of *Salmonella*, *Campylobacter*, *Plesiomonas*, and mixed pathogens.

FIGURE 11. Number of recreational water associated outbreaks of gastroenteritis (n = 206), by water type and year — United States, 1978–2004



Causes of RWI and WBDOs

- Common themes for treated and untreated venues
 - Low disinfectant levels
 - Inadequate water quality monitoring
 - High bather loads during large events
 - Breakdowns of equipment and lengthy detection times
 - Lack of essential cleaning of spas to minimize biofilm buildup
 - Accumulation of combined chlorines in pools accompanied by inadequate indoor air ventilation
 - Inadequately trained aquatic staff
 - Unclear communication chains for resolving problems
 - Outbreaks occurring on weekends when minimal staff on duty
 - Lack of awareness by general public of healthy swimming behaviors

Six PLEAs for Healthy Swimming

- PLEASE don't swim when you have diarrhea
- PLEASE don't swallow the water
- PLEASE practice good hygiene
- PLEASE take kids on bathroom breaks and check diapers often
- PLEASE change diapers in a bathroom not poolside or at the waters edge
- PLEASE wash your child thoroughly with soap and water before swimming

Why not wash your hands?



Protect the water
you're using and the
health of everyone
around you. Keep
yourself out of the pool
by washing your
hands.

Healthy Swimming
www.healthyswimming.org 

Healthy Swimming

Be "P.U.E." for Protection Against Recreational Water
Illnesses (RAWI)

- DO NOT** drink water other than
bottled. It is especially
important for kids to shower.
- DO NOT** drink or swallow the pool water.
- DO NOT** wash your hands with soap and
water after using the toilet or after
changing diapers.
- DO NOT** take your kid to bathroom breaks
often.
- DO NOT** change diapers in a bathroom and
not at all outside.
- DO NOT** wash your child thoroughly
immediately the way with soap
and water before swimming.





Baby bottoms are smooth. But they
should be clean too. Help keep the pool
clean.



Please wash
your child
thoroughly
(especially
the rear end)
with soap and
water before
swimming.



www.cdc.gov/healthyswimming



You wouldn't drink the water you **bathe** in.

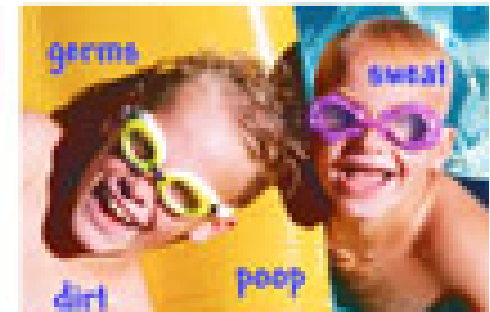


Why would you drink the water you **swim** in?

www.healthyswimming.org



There are some things you would rather NOT share.



Shower before swimming.



Healthy Swimming
www.healthyswimming.org



LANDSHARK™

Just when you thought it was safe

