CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

September 16, 1994 / Vol. 43 / No. 36

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Assessment of Inadequately Filtered Public Drinking Water — Washington, D.C., December 1993

The risk for waterborne infectious diseases increases when filtration and other standard water-treatment measures fail. On December 6, 1993, water-treatment plant operators in the District of Columbia (DC) began to have difficulty maintaining optimal filter effectiveness. On December 7, filter performance worsened, and levels of turbidity (i.e., small suspended particles) exceeded those permitted by U.S. Environmental Protection Agency (EPA) standards. On December 8, DC residents were advised to boil water intended for drinking because of high municipal water turbidity that may have included microbial contaminants. Although adequate chlorination of the DC municipal water was maintained throughout the period of increased turbidity, the parasite *Cryptosporidium parvum* is highly resistant to chlorination. Because of the increased risk for infection with this organism and other enteric pathogens, the DC Commission of Public Health and CDC conducted four investigations to determine whether excess cases of diarrheal illness occurred because residents drank inadequately filtered water. This report describes the results of these investigations.

The investigations included a random-digit–dialed telephone survey of DC residents and retrospective reviews of records from two emergency departments, two nursing homes, and seven hospital microbiology laboratories. The occurrence of diarrheal illness or presence of organisms in stool during the 2 weeks before the turbidity violation (period 1: November 22–December 5) was compared with that during the 2–3 weeks after the violation was first noted (period 2: December 6–December 21 or 26). The incubation period for cryptosporidiosis typically ranges from 2 to 14 days.

Telephone survey. The telephone survey sampled 1197 household members (0.2% of DC's 600,000 residents) from 462 households in all 22 DC residential ZIP code areas. The percentage of persons who reported having diarrhea (i.e., three or more loose or watery stools in a 24-hour period) were similar for period 1 (the reference period) and period 2 (2.8% versus 3.5%, respectively; relative risk [RR]=1.2; 95% confidence interval [CI]=0.8–1.9). A total of 37% of persons reported that bottled water was their principal source of drinking water at home, and 30% reported that bottled water was

Drinking Water — Continued

their primary source of drinking water both at home and at work. For both periods, reported use of bottled water was similar for persons with and without diarrhea.

Hospital emergency department survey. During the two periods, totals of 2140 (period 1) and 3315 (period 2) persons were evaluated at two DC hospital emergency departments. Medical records were reviewed for all persons with diagnoses suggestive of gastrointestinal illness* (104 and 211 persons for periods 1 and 2, respectively). The percentage of all persons who had diarrhea recorded in their emergency department charts was similar for periods 1 and 2 (1.5% versus 2.0%; RR=1.3; 95% CI=0.9–2.0). For both periods, approximately 70% of patients with diarrheal illness were DC residents. The percentages of stool specimens that were positive for enteric pathogens (i.e., bacteria, parasites, or rotavirus antigen) were similar for the two periods. During each period, two stool specimens were examined for *Cryptosporidium*: none were positive during period 1, and one was positive during period 2.

Nursing home survey. Medical records were reviewed for all 443 residents from two selected nursing homes (14% of the 3156 nursing home beds in DC). During both periods, the mean numbers of bowel movements per person per day were 1.3. In addition, the daily mean number of residents with loose or large-volume bowel movements were similar (27.1 and 27.8 persons for periods 1 and 2), and antidiarrheal medications were given at the same rate (0.002 doses per person per day) during both periods.

Microbiology laboratory survey. Data were obtained from microbiology laboratories of seven (64%) of the 11 DC hospitals. Although the total number of stool specimens examined for *Cryptosporidium* increased from period 1 (32 specimens) to period 2 (54 specimens), the percentage positive was lower—but not statistically different—for period 2 (12.5% versus 7.4%; RR=0.6; 95% CI=0.2–2.2). The percentages of stools positive for other pathogens (i.e., bacteria, *Giardia lamblia*, and rotavirus antigen) were similar for both periods.

Reported by: MN Akhter, MD, Commissioner, ME Levy, MD, District Epidemiologist, C Mitchell, R Boddie, District of Columbia Commission of Public Health. N Donegan, B Griffith, M Jones, Washington Hospital Center; TO Stair, MD, Georgetown Univ Medical Center, Washington, DC. Epidemiology Br, Div of Parasitic Diseases, National Center for Infectious Diseases, CDC.

Editorial Note: To ensure safe municipal drinking water supplies, water-treatment programs employ multiple barriers to prevent contaminants from reaching the consumer. These barriers include protection of the watershed, chemical disinfection, and filtration of surface water supplies such as lakes and rivers. When one of these barriers is absent or fails, the risk for waterborne disease may increase. The failure of the filtration process in DC prompted particular concerns about contamination with and exposure to *Cryptosporidium*.

Outbreaks of cryptosporidiosis resulting from surface water contamination have occurred when turbidity was 0.9–2.0 nephelometric turbidity units (NTU)[†]. For example, in a waterborne outbreak in Milwaukee in 1993, a peak turbidity of 1.7 NTU was associated with illness in approximately 400,000 persons (*1*). In DC, the turbidity levels reached 9.0 NTU.

---

*Gastroenteritis, diarrhea, nausea, vomiting, gastritis, viral syndrome, dehydration, and hyperemesis gravidarum.

†The American Waterworks Association encourages water utilities to maintain turbidity measurements of water as it leaves the treatment plant at or below 0.1 NTU.

Drinking Water — Continued

Because *Cryptosporidium* is highly resistant to chlorination, disinfection of water is not a reliable method for preventing exposure to it. The failure to detect increased rates of illness among residents of DC probably reflects the absence of, or presence of only a small number of, oocysts in the water that supplied the municipal water-treatment plant at the time the filtration failure occurred. In addition, the investigations in DC did not detect any increase in diarrheal illness associated with the elevated water turbidity; however, the sample sizes in these investigations were too small to rule out low-level transmission of waterborne agents. For example, the telephone survey probably would not have detected an outbreak affecting fewer than 12,000 persons.

Cryptosporidium is present in 65%–87% of surface water samples tested throughout the United States (*2,3*). However, because current techniques to detect *Cryptosporidium* in water are cumbersome, costly, and insensitive, tests to detect it are not routinely performed by water utilities. During 1995, EPA plans to collect additional information about *Cryptosporidium* and other microorganisms in surface water used by municipal water-treatment facilities in the United States and to assess the effectiveness of water-treatment methods for removing them.[§]

The early detection of waterborne outbreaks of cryptosporidiosis is difficult for at least four reasons: 1) many physicians are unaware that *Cryptosporidium* can cause watery diarrhea; 2) the symptom complex often resembles a viral syndrome; 3) clinical laboratories often do not routinely test for *Cryptosporidium* when a physician requests a stool examination for ova and parasites; and 4) few states include cryptosporidiosis as a reportable disease.

Variations in recommendations regarding the duration of boiling during boil-water advisories have reflected uncertainty about how long some organisms can survive. On the basis of a recent literature review, CDC and EPA recommend that water be rendered microbiologically safe for drinking by bringing it to a rolling boil for 1 minute; this will inactivate all major waterborne bacterial pathogens (i.e., *Vibrio cholerae*, enterotoxigenic *Escherichia coli*, *Salmonella*, *Shigella sonnei*, *Campylobacter jejuni*, *Yersinia enterocolitica*, and *Legionella pneumophila*) and waterborne protozoa (e.g., *Cryptosporidium parvum*, *Giardia lamblia*, and *Entamoeba histolytica* [*4–7*]). Although information about thermal inactivation is incomplete for waterborne viral pathogens, hepatitis A virus—considered one of the more heat-resistant waterborne viruses (*8*)—also is rendered noninfectious by boiling for 1 minute (*9*). If viral pathogens are suspected in drinking water in communities at elevations above 6562 ft (2 km), the boiling time should be extended to 3 minutes.

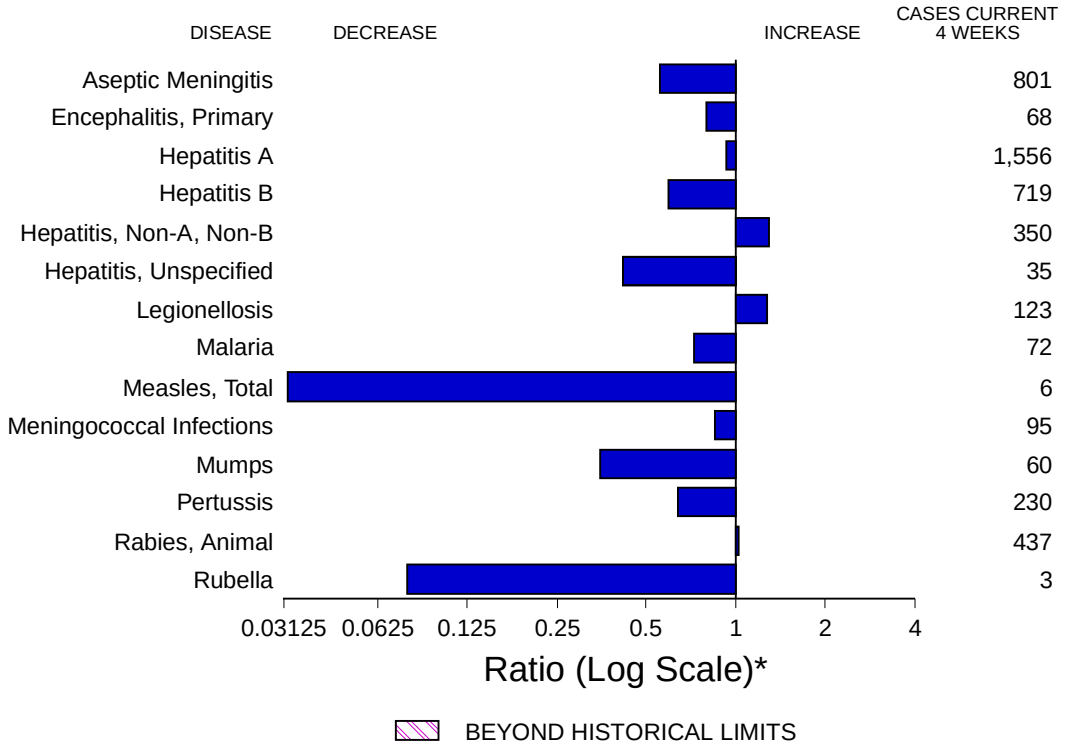
References

1. Mac Kenzie WR, Hoxie NJ, Proctor ME, et al. A massive outbreak in Milwaukee of Cryptosporidium infection transmitted through the public water supply. N Engl J Med 1994;331:161–7.
2. Rose JB, Gerba CP, Jakubowski W. Survey of potable water supplies for *Cryptosporidium* and *Giardia*. Environmental Science and Technology 1991;25:1393–400.
3. LeChevallier MW, Norton WD, Lee RG. Occurrence of *Giardia* and *Cryptosporidium* spp. in surface water supplies. Appl Environ Microbiol 1991;57:2610–6.
4. Bandres JC, Mathewson JJ, Dupont HL. Heat susceptibility of bacterial enteropathogens. Arch Intern Med 1988;148:2261–3.

[§]59 FR 6332.

(Continued on page 669)

FIGURE I. Notifiable disease reports, comparison of 4-week totals ending September 10, 1994, with historical data — United States



*Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

TABLE I. Summary — cases of specified notifiable diseases, United States, cumulative, week ending September 10, 1994 (36th Week)

	Cum. 1994		Cum. 1994
AIDS*	53,596	Measles: imported	163
Anthrax	-	indigenous	642
Botulism: Foodborne	44	Plague	12
Infant	50	Poliomyelitis, Paralytic§	1
Other	6	Psittacosis	25
Brucellosis	62	Rabies, human	1
Cholera	10	Syphilis, primary & secondary	14,836
Congenital rubella syndrome	2	Syphilis, congenital, age < 1 year¶	532
Diphtheria	1	Tetanus	24
Encephalitis, post-infectious	84	Toxic shock syndrome	131
Gonorrhea	259,858	Trichinosis	27
Haemophilus influenzae (invasive disease)†	814	Tuberculosis	14,718
Hansen Disease	82	Tularemia	63
Leptospirosis	22	Typhoid fever	288
Lyme Disease	7,132	Typhus fever, tickborne (RMSF)	299

*Updated monthly to the Division of HIV/AIDS, National Center for Infectious Diseases; last update August 30, 1994.
†Of 775 cases of known age, 215 (28%) were reported among children less than 5 years of age.
§The remaining 5 suspected cases with onset in 1994 have not yet been confirmed. In 1993, 3 of 10 suspected cases were confirmed. Two of the confirmed cases of 1993 were vaccine-associated and one was classified as imported.
¶Total reported to the Division of Sexually Transmitted Diseases and HIV Prevention, National Center for Prevention Services, through first quarter 1994.

TABLE II. Cases of selected notifiable diseases, United States, weeks ending September 10, 1994, and September 11, 1993 (36th Week)

Reporting Area	AIDS*	Aseptic Meningitis	Encephalitis		Gonorrhea		Hepatitis (Viral), by type				Legionellosis	Lyme Disease
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1993	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994
UNITED STATES	53,596	5,085	423	84	259,858	272,289	15,001	7,935	2,982	301	1,117	7,132
NEW ENGLAND	1,990	196	13	4	5,521	5,116	205	241	99	16	42	1,992
Maine	71	20	2	-	62	57	20	11	-	-	4	16
N.H.	44	23	-	2	75	43	13	16	8	-	-	16
Vt.	22	21	1	-	21	18	6	-	-	-	-	10
Mass.	1,031	57	8	1	2,152	2,033	83	155	71	14	31	169
R.I.	170	75	2	1	324	288	18	6	20	2	7	307
Conn.	652	-	-	-	2,887	2,677	65	53	-	-	-	1,474
MID. ATLANTIC	16,214	548	40	15	28,188	30,139	1,151	975	334	9	174	4,189
Upstate N.Y.	1,504	244	21	2	7,039	6,649	392	270	168	5	42	2,616
N.Y. City	9,831	106	6	5	9,429	7,880	454	222	1	-	7	11
N.J.	3,252	-	-	-	3,350	3,042	202	256	137	-	30	933
Pa.	1,627	198	13	8	8,370	12,568	103	227	28	4	95	629
E.N. CENTRAL	4,228	875	107	19	49,936	57,433	1,475	796	218	7	349	68
Ohio	797	225	31	3	14,643	15,462	582	118	17	-	160	48
Ind.	441	131	9	1	6,066	5,642	261	139	9	-	93	11
Ill.	2,035	190	35	5	12,524	19,650	305	161	44	3	16	4
Mich.	703	322	28	10	12,216	12,152	188	265	145	4	55	5
Wis.	252	7	4	-	4,487	4,527	139	113	3	-	25	-
W.N. CENTRAL	1,083	273	19	5	14,226	14,754	700	449	112	10	94	124
Minn.	274	20	2	-	2,265	1,554	160	43	17	1	1	66
Iowa	59	82	-	-	1,048	1,194	37	22	7	8	27	13
Mo.	486	98	7	4	8,261	8,765	309	341	67	1	42	28
N. Dak.	18	6	2	-	18	35	3	-	-	-	4	-
S. Dak.	11	-	2	-	129	180	24	-	-	-	1	-
Nebr.	65	14	4	1	-	484	89	19	8	-	14	9
Kans.	170	53	2	-	2,505	2,542	78	24	13	-	5	8
S. ATLANTIC	11,932	1,041	88	26	72,700	69,859	1,004	1,721	466	28	253	571
Del.	188	30	1	-	1,323	975	15	4	1	-	26	25
Md.	1,597	175	17	4	12,475	10,972	140	284	27	6	62	233
D.C.	986	35	-	1	5,028	3,066	17	40	-	-	8	4
Va.	778	179	22	6	9,174	8,395	119	89	20	5	6	113
W. Va.	40	22	11	-	545	443	10	29	23	-	1	13
N.C.	887	165	36	1	18,528	17,192	91	193	47	-	18	63
S.C.	780	24	-	-	9,056	7,543	30	23	7	-	9	7
Ga.	1,371	47	1	-	-	4,660	24	506	163	-	91	98
Fla.	5,305	364	-	14	16,571	16,613	558	553	178	17	32	15
E.S. CENTRAL	1,441	333	27	2	31,064	31,237	358	759	605	2	45	32
Ky.	226	115	12	1	3,437	3,286	114	58	20	-	8	16
Tenn.	483	56	10	-	9,341	9,568	135	645	572	1	22	10
Ala.	422	126	5	1	10,849	11,340	69	56	13	1	11	6
Miss.	310	36	-	-	7,437	7,043	40	-	-	-	4	-
W.S. CENTRAL	5,361	560	40	2	31,668	30,842	2,207	974	382	60	35	87
Ark.	182	37	-	-	4,735	4,665	144	20	6	1	7	7
La.	864	26	5	-	8,489	8,305	111	126	124	1	10	1
Okla.	193	-	-	-	2,832	3,208	206	228	213	1	12	48
Tex.	4,122	497	35	2	15,612	14,664	1,746	600	39	57	6	31
MOUNTAIN	1,551	189	6	3	5,716	8,024	2,825	438	309	39	68	13
Mont.	18	6	-	-	66	53	17	20	6	-	14	-
Idaho	45	4	-	-	61	130	242	65	63	1	1	3
Wyo.	16	2	1	2	54	63	21	18	110	-	3	3
Colo.	580	78	1	-	1,883	2,670	352	71	50	13	15	-
N. Mex.	118	11	-	-	683	647	809	151	42	9	3	5
Ariz.	421	44	-	-	2,181	2,879	908	29	8	9	7	-
Utah	96	23	-	1	176	314	323	47	18	1	7	1
Nev.	257	21	4	-	612	1,268	153	37	12	6	18	1
PACIFIC	9,796	1,070	83	8	20,839	24,885	5,076	1,582	457	130	57	56
Wash.	636	-	-	-	1,936	2,643	249	50	50	1	6	-
Oreg.	431	-	-	-	570	846	356	33	11	1	-	-
Calif.	8,570	964	81	7	17,270	20,615	4,268	1,466	391	125	48	56
Alaska	32	16	2	-	600	408	160	9	-	-	-	-
Hawaii	127	90	-	1	463	373	43	24	5	3	3	-
Guam	1	9	-	-	87	74	19	2	-	4	2	-
P.R.	1,578	24	-	3	306	349	49	242	110	10	-	-
V.I.	34	-	-	-	17	79	-	1	-	-	-	-
Amer. Samoa	-	-	-	-	20	35	5	-	-	-	-	-
C.N.M.I.	-	-	-	-	31	65	4	1	-	-	-	-

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly to the Division of HIV/AIDS, National Center for Infectious Diseases; last update August 30, 1994.

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending September 10, 1994, and September 11, 1993 (36th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1994	1994	Cum. 1994	1994	Cum. 1994	Cum. 1993	Cum. 1994	1994	Cum. 1994	1994	Cum. 1994	Cum. 1993	1994	Cum. 1994	Cum. 1993
UNITED STATES	695	1	642	-	163	261	1,882	18	984	42	2,252	3,643	-	205	159
NEW ENGLAND	56	-	14	-	14	61	98	1	15	12	232	524	-	127	1
Maine	4	-	1	-	4	1	18	-	3	6	9	15	-	-	1
N.H.	3	-	1	-	-	2	7	-	4	4	52	121	-	-	-
Vt.	3	-	2	-	1	31	2	-	-	-	28	62	-	-	-
Mass.	27	-	2	-	6	17	40	-	-	2	119	275	-	123	-
R.I.	5	-	4	-	3	1	-	1	2	-	5	7	-	2	-
Conn.	14	-	4	-	-	9	31	-	6	-	19	44	-	2	-
MID. ATLANTIC	130	-	167	-	22	21	188	-	79	5	394	531	-	9	56
Upstate N.Y.	35	-	12	-	3	5	64	-	21	5	170	162	-	6	14
N.Y. City	47	-	14	-	2	7	11	-	8	-	73	49	-	1	22
N.J.	28	-	137	-	14	9	45	-	6	-	9	55	-	2	15
Pa.	20	-	4	-	3	-	68	-	44	-	142	265	-	-	5
E.N. CENTRAL	64	-	59	-	41	27	300	1	151	2	297	899	-	11	7
Ohio	8	-	15	-	-	9	83	-	42	-	106	207	-	-	1
Ind.	13	-	-	-	1	-	49	1	7	1	48	67	-	-	2
Ill.	23	-	17	-	39	9	95	-	65	-	59	316	-	3	1
Mich.	18	-	24	-	1	6	42	-	33	1	35	46	-	8	2
Wis.	2	-	3	-	-	3	31	-	4	-	49	263	-	-	1
W.N. CENTRAL	31	-	116	-	42	3	131	1	47	1	117	288	-	2	1
Minn.	10	-	-	-	-	-	11	-	5	-	51	146	-	-	-
Iowa	4	-	6	-	1	-	16	-	12	1	8	20	-	-	-
Mo.	11	-	108	-	40	1	66	1	25	-	29	86	-	2	1
N. Dak.	1	-	-	-	-	-	1	-	3	-	5	5	-	-	-
S. Dak.	-	-	-	-	-	-	7	-	-	-	7	8	-	-	-
Nebr.	3	U	1	U	1	-	9	U	2	U	7	8	U	-	-
Kans.	2	-	1	-	-	2	21	-	-	-	10	15	-	-	-
S. ATLANTIC	153	1	49	-	6	25	324	4	150	2	228	318	-	10	6
Del.	3	-	-	-	-	-	5	-	-	-	2	8	-	-	-
Md.	74	-	2	-	2	4	29	-	46	-	66	94	-	-	2
D.C.	11	-	-	-	-	-	3	-	-	-	5	7	-	-	-
Va.	20	-	1	-	1	1	52	3	35	1	28	42	-	-	-
W. Va.	-	-	36	-	-	-	11	-	3	-	3	8	-	-	-
N.C.	7	-	2	-	1	-	42	-	36	-	58	51	-	-	-
S.C.	4	-	-	-	-	-	19	1	7	-	12	10	-	-	-
Ga.	18	-	2	-	-	-	65	-	8	1	22	31	-	1	-
Fla.	16	1	6	-	2	20	98	-	15	-	32	67	-	9	4
E.S. CENTRAL	25	-	28	-	-	1	114	-	18	2	110	236	-	-	-
Ky.	7	-	-	-	-	-	33	-	-	1	57	28	-	-	-
Tenn.	8	-	28	-	-	-	25	-	7	-	18	148	-	-	-
Ala.	9	-	-	-	-	1	56	-	5	1	29	50	-	-	-
Miss.	1	-	-	-	-	-	-	-	6	-	6	10	-	-	-
W.S. CENTRAL	35	-	9	-	7	10	235	3	191	1	105	91	-	12	17
Ark.	3	-	-	-	1	-	37	-	1	-	18	7	-	-	-
La.	6	-	-	-	1	1	29	-	22	1	10	8	-	-	1
Okla.	3	-	-	-	-	-	25	-	23	-	22	54	-	4	1
Tex.	23	-	9	-	5	9	144	3	145	-	55	22	-	8	15
MOUNTAIN	23	-	148	-	17	4	123	5	113	9	302	278	-	5	9
Mont.	-	-	-	-	-	-	6	-	-	-	4	4	-	-	-
Idaho	2	-	-	-	-	-	15	-	7	-	42	78	-	-	1
Wyo.	1	-	-	-	-	-	5	-	2	-	-	1	-	-	-
Colo.	11	-	16	-	3	3	24	-	2	-	108	89	-	-	2
N. Mex.	3	-	-	-	-	-	13	N	N	-	20	33	-	1	-
Ariz.	1	-	1	-	1	-	40	5	79	9	113	45	-	-	2
Utah	4	-	131	-	2	-	15	-	11	-	13	25	-	3	3
Nev.	1	U	-	U	11	1	5	U	11	U	2	3	U	1	1
PACIFIC	178	-	52	-	14	109	369	3	220	8	467	478	-	29	62
Wash.	7	-	-	-	-	-	25	-	6	-	26	43	-	-	-
Oreg.	8	-	-	-	1	4	64	N	N	3	38	30	-	2	-
Calif.	148	-	46	-	9	84	272	1	196	4	386	396	-	22	35
Alaska	1	-	6	-	-	1	2	-	2	-	-	5	-	1	1
Hawaii	14	-	-	-	4	20	6	2	16	1	17	4	-	4	26
Guam	2	U	211	U	-	2	1	U	4	U	2	-	U	1	-
P.R.	2	-	13	-	-	337	7	-	2	-	1	1	-	-	-
V.I.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amer. Samoa	-	U	-	U	-	-	-	U	1	U	2	2	U	-	-
C.N.M.I.	1	U	26	U	-	1	-	U	2	U	-	1	U	-	-

*For measles only, imported cases include both out-of-state and international importations.
N: Not notifiable U: Unavailable † International § Out-of-state

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending September 10, 1994, and September 11, 1993 (36th Week)

Reporting Area	Syphilis (Primary & Secondary)		Toxic-Shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1994	Cum. 1993	Cum. 1994	Cum. 1994	Cum. 1993	Cum. 1994	Cum. 1994	Cum. 1994	Cum. 1994
UNITED STATES	14,836	18,279	131	14,718	15,433	63	288	299	4,249
NEW ENGLAND	157	249	4	334	333	-	20	11	1,289
Maine	4	4	1	8	15	-	-	-	-
N.H.	3	22	-	14	15	-	-	-	112
Vt.	-	1	1	3	4	-	-	-	102
Mass.	66	102	2	177	181	-	16	8	485
R.I.	12	11	-	32	41	-	1	-	26
Conn.	72	109	-	100	77	-	3	3	564
MID. ATLANTIC	946	1,669	22	2,923	3,251	1	81	13	481
Upstate N.Y.	125	153	12	185	497	1	7	5	115
N.Y. City	417	810	-	1,835	1,958	-	59	1	-
N.J.	138	218	-	533	337	-	15	2	203
Pa.	266	488	10	370	459	-	-	5	163
E.N. CENTRAL	1,985	3,060	25	1,418	1,580	7	52	37	42
Ohio	833	840	9	233	226	1	5	24	2
Ind.	175	257	2	122	152	2	5	5	12
Ill.	545	1,185	5	720	830	2	31	6	11
Mich.	203	418	9	302	309	1	4	2	10
Wis.	229	360	-	41	63	1	7	-	7
W.N. CENTRAL	844	1,188	20	394	332	25	1	24	149
Minn.	36	46	1	95	41	1	-	-	13
Iowa	43	53	7	44	39	-	-	1	65
Mo.	725	971	5	167	176	16	1	10	13
N. Dak.	-	4	1	6	6	-	-	-	8
S. Dak.	-	2	-	17	11	1	-	10	23
Nebr.	-	10	2	18	16	1	-	1	-
Kans.	40	102	4	47	43	6	-	2	27
S. ATLANTIC	4,325	4,769	7	2,586	3,111	1	38	142	1,412
Del.	21	84	-	26	32	-	1	-	41
Md.	194	259	-	221	268	-	8	11	383
D.C.	161	248	-	90	124	-	1	-	2
Va.	548	458	1	214	309	-	6	14	279
W. Va.	8	9	-	60	60	-	-	2	58
N.C.	1,183	1,342	1	344	357	-	-	47	115
S.C.	560	719	-	253	280	-	-	11	132
Ga.	1,074	790	1	591	540	1	2	54	272
Fla.	576	860	4	787	1,141	-	20	3	130
E.S. CENTRAL	2,632	2,739	4	942	1,121	-	2	25	135
Ky.	148	225	2	233	263	-	1	6	13
Tenn.	697	785	2	289	338	-	1	13	34
Ala.	467	589	-	285	345	-	-	2	88
Miss.	1,320	1,140	-	135	175	-	-	4	-
W.S. CENTRAL	3,197	3,531	1	2,028	1,722	17	11	35	467
Ark.	360	395	-	208	125	15	-	7	23
La.	1,253	1,791	-	94	177	-	3	-	55
Okla.	100	227	1	186	103	2	2	24	25
Tex.	1,484	1,118	-	1,540	1,317	-	6	4	364
MOUNTAIN	181	171	6	316	380	9	9	12	96
Mont.	3	1	-	9	13	3	-	4	13
Idaho	1	-	1	11	10	-	-	-	3
Wyo.	-	7	-	5	2	-	-	2	15
Colo.	96	48	3	21	56	1	3	4	8
N. Mex.	18	24	-	43	46	1	1	-	4
Ariz.	33	73	-	154	157	-	1	1	37
Utah	7	4	2	29	23	2	2	-	10
Nev.	23	14	-	44	73	2	2	1	6
PACIFIC	569	903	42	3,777	3,603	3	74	-	178
Wash.	39	38	2	197	176	-	3	-	-
Oreg.	21	35	-	90	-	2	3	-	8
Calif.	503	819	37	3,271	3,199	-	64	-	141
Alaska	4	6	-	36	46	1	-	-	29
Hawaii	2	5	3	183	182	-	4	-	-
Guam	4	3	-	68	42	-	1	-	-
P.R.	200	376	-	86	165	-	-	-	51
V.I.	22	34	-	-	2	-	-	-	-
Amer. Samoa	1	-	-	4	4	-	1	-	-
C.N.M.I.	2	3	-	22	24	-	1	-	-

U: Unavailable

TABLE III. Deaths in 121 U.S. cities,* week ending September 10, 1994 (36th Week)

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	473	310	87	49	16	11	24
Boston, Mass.	96	52	22	13	3	6	1
Bridgeport, Conn.	32	20	6	2	3	1	1
Cambridge, Mass.	27	15	4	6	2	-	1
Fall River, Mass.	21	16	4	1	-	-	-
Hartford, Conn.	53	35	12	4	2	-	3
Lowell, Mass.	20	15	2	3	-	-	1
Lynn, Mass.	11	6	2	3	-	-	-
New Bedford, Mass.	27	23	2	2	-	-	2
New Haven, Conn.	44	28	10	3	2	1	2
Providence, R.I.	20	13	4	1	2	-	1
Somerville, Mass.	U	U	U	U	U	U	U
Springfield, Mass.	34	24	4	4	1	1	2
Waterbury, Conn.	25	19	5	1	-	-	3
Worcester, Mass.	63	44	10	6	1	2	7
MID. ATLANTIC	2,134	1,358	377	308	53	38	94
Albany, N.Y.	46	32	9	4	1	-	1
Allentown, Pa.	20	17	2	1	-	-	-
Buffalo, N.Y.	U	U	U	U	U	U	U
Camden, N.J.	22	10	3	5	2	2	-
Elizabeth, N.J.	20	10	5	5	-	-	-
Erie, Pa.§	37	30	6	-	-	1	1
Jersey City, N.J.	55	35	7	8	3	2	-
New York City, N.Y.	1,229	764	223	196	27	19	45
Newark, N.J.	56	21	14	17	4	-	4
Paterson, N.J.	9	5	2	2	-	-	1
Philadelphia, Pa.	304	186	53	48	11	6	18
Pittsburgh, Pa.§	59	39	10	6	1	3	4
Reading, Pa.	15	12	1	2	-	-	1
Rochester, N.Y.	104	78	15	7	2	2	7
Schenectady, N.Y.	30	25	5	-	-	-	2
Scranton, Pa.§	22	18	3	1	-	-	2
Syracuse, N.Y.	72	50	14	3	2	3	6
Trenton, N.J.	16	9	4	3	-	-	-
Utica, N.Y.	18	17	1	-	-	-	2
Yonkers, N.Y.	U	U	U	U	U	U	U
E.N. CENTRAL	1,975	1,235	373	210	111	46	107
Akron, Ohio	64	41	10	7	-	6	-
Canton, Ohio	38	25	8	2	1	2	4
Chicago, Ill.	447	209	88	81	64	5	20
Cincinnati, Ohio	115	85	15	11	2	2	12
Cleveland, Ohio	123	70	32	10	5	6	-
Columbus, Ohio	182	116	41	17	4	4	11
Dayton, Ohio	111	80	20	7	2	2	11
Detroit, Mich.	176	89	42	30	7	8	5
Evansville, Ind.	40	31	6	3	-	-	-
Fort Wayne, Ind.	38	32	3	2	1	-	3
Gary, Ind.	15	7	2	3	2	1	1
Grand Rapids, Mich.	58	44	9	2	3	-	4
Indianapolis, Ind.	150	104	23	12	5	6	14
Madison, Wis.	51	34	12	1	2	2	3
Milwaukee, Wis.	91	65	19	7	-	-	4
Peoria, Ill.	32	26	6	-	-	-	2
Rockford, Ill.	56	43	9	1	2	1	2
South Bend, Ind.	39	32	2	1	4	-	5
Toledo, Ohio	102	67	19	9	6	1	6
Youngstown, Ohio	47	35	7	4	1	-	-
W.N. CENTRAL	631	449	111	39	17	15	47
Des Moines, Iowa	109	80	18	8	-	3	6
Duluth, Minn.	23	17	5	1	-	-	-
Kansas City, Kans.	15	12	2	1	-	-	-
Kansas City, Mo.	76	42	21	7	5	1	5
Lincoln, Nebr.	17	14	2	1	-	-	3
Minneapolis, Minn.	128	93	20	10	1	4	10
Omaha, Nebr.	76	59	11	1	3	2	3
St. Louis, Mo.	103	68	20	5	5	5	10
St. Paul, Minn.	51	42	5	4	-	-	10
Wichita, Kans.	33	22	7	1	3	-	-
S. ATLANTIC	1,084	631	227	153	43	30	51
Atlanta, Ga.	108	63	28	15	2	-	6
Baltimore, Md.	195	109	46	32	7	1	13
Charlotte, N.C.	65	34	14	7	4	6	3
Jacksonville, Fla.	120	73	25	14	5	3	8
Miami, Fla.	94	42	24	21	5	2	1
Norfolk, Va.	40	17	7	8	2	6	2
Richmond, Va.	73	40	18	11	3	1	1
Savannah, Ga.	47	30	11	4	1	1	2
St. Petersburg, Fla.	48	38	6	1	2	1	-
Tampa, Fla.	154	105	24	16	5	4	14
Washington, D.C.	130	70	24	24	7	5	1
Wilmington, Del.	10	10	-	-	-	-	-
E.S. CENTRAL	664	403	159	71	21	10	42
Birmingham, Ala.	89	60	16	5	5	3	2
Chattanooga, Tenn.	63	43	10	7	3	-	8
Knoxville, Tenn.	96	61	23	10	2	-	9
Lexington, Ky.	57	37	13	3	2	2	3
Memphis, Tenn.	149	84	42	19	3	1	11
Mobile, Ala.	57	32	13	7	3	2	2
Montgomery, Ala.	29	17	7	4	1	-	2
Nashville, Tenn.	124	69	35	16	2	2	5
W.S. CENTRAL	1,165	713	225	145	40	42	60
Austin, Tex.	44	29	8	6	1	-	2
Baton Rouge, La.	50	32	7	7	4	-	1
Corpus Christi, Tex.	42	32	5	3	1	1	3
Dallas, Tex.	156	89	30	28	7	2	-
El Paso, Tex.	29	16	5	5	-	3	8
Ft. Worth, Tex.	90	51	21	10	7	1	2
Houston, Tex.	289	156	67	37	5	24	22
Little Rock, Ark.	59	42	8	5	1	3	5
New Orleans, La.	61	29	15	10	3	4	-
San Antonio, Tex.	145	93	26	17	6	3	6
Shreveport, La.	107	75	20	9	3	-	8
Tulsa, Okla.	93	69	13	8	2	1	3
MOUNTAIN	709	464	126	76	23	20	41
Albuquerque, N.M.	78	52	12	7	4	3	2
Colo. Springs, Colo.	40	23	9	5	2	1	1
Denver, Colo.	114	77	18	13	2	4	5
Las Vegas, Nev.	147	84	37	20	2	4	10
Ogden, Utah	U	U	U	U	U	U	U
Phoenix, Ariz.	120	87	7	17	5	4	10
Pueblo, Colo.	28	18	5	4	1	-	-
Salt Lake City, Utah	81	58	13	3	4	3	5
Tucson, Ariz.	101	65	25	7	3	1	8
PACIFIC	1,597	1,039	302	171	48	28	120
Berkeley, Calif.	24	17	4	3	-	-	-
Fresno, Calif.	69	38	13	9	5	4	4
Glendale, Calif.	27	16	6	4	1	-	1
Honolulu, Hawaii	72	54	16	2	-	-	6
Long Beach, Calif.	73	51	11	8	-	3	7
Los Angeles, Calif.	413	252	84	52	15	1	25
Pasadena, Calif.	27	18	4	2	1	2	4
Portland, Oreg.	133	89	26	15	2	1	5
Sacramento, Calif.	158	111	22	13	6	6	18
San Diego, Calif.	82	49	17	15	1	-	7
San Francisco, Calif.	112	64	24	21	3	-	16
San Jose, Calif.	127	86	22	12	4	3	14
Santa Cruz, Calif.	21	17	3	-	-	1	1
Seattle, Wash.	120	75	28	8	6	3	1
Spokane, Wash.	59	44	8	3	3	1	4
Tacoma, Wash.	80	58	14	4	1	3	7
TOTAL	10,432¶	6,602	1,987	1,222	372	240	586

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

†Pneumonia and influenza.

§Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

¶Total includes unknown ages.

U: Unavailable.

Drinking Water — Continued

5. Anderson BC. Moist heat inactivation of *Cryptosporidium* sp. Am J Public Health 1985;75: 1433–4.
6. Bingham AK, Jarroll EL, Meyer EA. *Giardia* sp.: physical factors of excystation in vitro, and excystation vs eosin exclusion as determinants of viability. Exp Parasitol 1979;47:284–91.
7. Boeck WC. The thermal-death point of the human intestinal protozoan cysts. Am J Hygiene 1921;1:365–87.
8. Larkin EP. Viruses of vertebrates: thermal resistance. In: Rechcigl M Jr, ed. CRC handbook of foodborne diseases of biological origin. Boca Raton, Florida: CRC Press, Inc, 1983:3–24.
9. Krugman S, Giles JP, Hammond J. Hepatitis virus: effect of heat on the infectivity and antigenicity of the MS-1 and MS-2 strains. J Infect Dis 1970;122:432–6.

Epidemiologic Notes and Reports

Outbreak of *Salmonella enteritidis* Associated with Homemade Ice Cream — Florida, 1993

On September 7, 1993, the Epidemiology Program of the Duval County (Florida) Public Health Unit was notified about an outbreak of acute febrile gastroenteritis among persons who attended a cookout at a psychiatric treatment hospital in Jacksonville, Florida. This report summarizes the outbreak investigation.

On September 6, seven children (age range: 7–9 years) and seven adults (age range: 29–51 years) attended the cookout at the hospital. A case of gastroenteritis was defined as onset of diarrhea, nausea or vomiting, abdominal pain, or fever within 72 hours of attending the cookout. Among the 14 attendees, 12 cases (in five of the children and all seven adults) were identified. The median incubation period was 14 hours (range: 7–21 hours); the mean duration of illness was 18 hours (range: 8–40 hours). Predominant symptoms were diarrhea (93%), nausea or vomiting (86%), abdominal pain (86%), and fever (86%). All ill persons were examined by a physician. *Salmonella enteritidis* (SE) (phage type 13a) was isolated from stool of three of the seven patients from whom specimens were obtained.

Eleven of the 12 ill persons had eaten homemade ice cream served at the cookout. No other food item was associated with illness. Testing of a sample of ice cream revealed contamination with SE (phage type 13a).

The ice cream was prepared at the hospital on September 6 using a recipe that included six grade A raw eggs. An electric ice cream churn was used to make the ice cream approximately 3 hours before the noon meal. The ice cream had been properly cooled, and no food-handling errors were identified. The person who prepared the ice cream was not ill before preparation; however, she became ill 13 hours after eating the ice cream. Her stool specimen was one of the three stools positive for SE (phage type 13a).

The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service attempted to trace the implicated eggs back to the farm of origin. The hospital purchased eggs from a distributor in Florida. However, the traceback was terminated because the implicated eggs from the distributor had been purchased from two suppliers—one of whom bought and mixed eggs from many different sources. Current USDA *Salmonella* regulations limit testing of flocks to one clearly implicated flock.

Salmonella enteritidis — *Continued*

Reported by: P Buckner, MPH, D Ferguson, HRS Duval County Public Health Unit, F Anzalone, MD, D Anzalone, DrPH, College of Health, Univ of North Florida, Jacksonville; J Taylor, Office of Lab Svcs, WG Hlady, MD, RS Hopkins, MD, State Epidemiologist, State Health Office, Florida Dept of Health and Rehabilitative Svcs. Foodborne and Diarrheal Diseases Br, Div of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC.

Editorial Note: The outbreak described in this report represents the fourth SE outbreak in Florida since 1985; this outbreak is the first in the state to implicate eggs. In the United States, the number of sporadic and outbreak-associated cases of SE infection has increased substantially since 1985; much of the increase can be attributed to consumption of raw or undercooked eggs (*1–3*). During 1983–1992, the proportion of reported *Salmonella* isolates that were SE increased from 8% to 19%. During 1985–1993, a total of 504 SE outbreaks were reported to CDC and resulted in 18,195 cases, 1978 hospitalizations, and 62 deaths (Table 1). Of the 233 outbreaks for which epidemiologic evidence was sufficient to implicate a food vehicle, 193 (83%) were associated with eggs. Of these 193 outbreaks, 14 (7%) were associated with consumption of homemade ice cream. No outbreaks have been associated with pasteurized egg products.

After eggs are identified by public health officials as the cause of an SE outbreak, USDA attempts to trace the implicated eggs back to the farm of origin to conduct serologic and microbiologic assessments of the farm. If SE is detected on the source farm, the eggs are diverted to pasteurization, or the flocks are destroyed. Under current regulations, USDA can pursue the traceback only if one farm is identified as the source. During 1990–1993, the success rate of USDA tracebacks to the source farm declined from 86% (19/22 outbreaks) in 1990 to 17% (3/21 outbreaks) in 1993. The rate declined primarily because eggs increasingly have been marketed in shipments containing eggs from multiple sources.

Although 0.01% of all eggs contain SE and, therefore, pose a risk for infection with SE (*4*), raw or undercooked eggs are consumed frequently. Based on the Food and Drug Administration (FDA) Food Safety Survey conducted in 1993, 53% of a nationally representative sample of 1620 respondents reported ever eating foods containing raw eggs; of these, 50% had eaten cookie batter, and 36% had eaten ice cream containing raw eggs (S. Fein, FDA, personal communication, September 9, 1994). Many persons may eat raw or undercooked eggs because they are unaware that eggs are a potential

TABLE 1. Number of reported outbreaks, associated cases, hospitalizations, and deaths caused by *Salmonella enteritidis,* by year — United States, 1985–1993

Year	No. outbreaks	No. cases	No. hospitalizations	No. deaths
1985	26	1,166	144	1
1986	48	1,539	131	6
1987	53	2,498	523	15
1988	40	1,010	121	8
1989	77	2,394	175	14
1990	70	2,273	288	4
1991	68	2,346	151	4
1992	59	2,748	229	4
1993	63	2,221	216	6
Total	**504**	**18,195**	**1,978**	**62**

Salmonella enteritidis — *Continued*

source of *Salmonella* (*3*) and that certain foods (e.g., homemade ice cream, cookie batter, Caesar salad, and hollandaise sauce) contain raw eggs.

Consumers should be informed that eating undercooked eggs may result in *Salmonella* infection. In addition, eggs should be refrigerated to prevent proliferation of *Salmonella* if present and should be cooked thoroughly to kill *Salmonella*. Because most serious illnesses and deaths associated with salmonellosis occur among the elderly and immunocompromised persons, these persons in particular should not eat foods contain- ing raw or undercooked eggs. Hospitals, nursing homes, and commercial kitchens should use pasteurized egg products for all recipes requiring pooled eggs or raw or undercooked eggs and should refrigerate all eggs and egg products.

References

1. St. Louis ME, Morse DL, Potter ME, et al. The emergence of grade A eggs as a major source of *Salmonella enteritidis* infections: new implications for the control of salmonellosis. JAMA 1988;259:2103–7.
2. Mishu B, Koehler J, Lee LA, et al. Outbreaks of *Salmonella enteritidis* infections in the United States, 1985–1991. J Infect Dis 1994;169:547–52.
3. Hedberg CW, David MJ, White KE, MacDonald KL, Osterholm MT. Role of egg consumption in sporadic *Salmonella enteritidis* and *Salmonella typhimurium* infections in Minnesota. J Infect Dis 1993;167:107–11.
4. Mason J, Ebel E. APHIS *Salmonella enteritidis* Control Program [Abstract]. In: Snoeyenbos GH, ed. Proceedings of the Symposium on the Diagnosis and Control of *Salmonella*. Richmond, Virginia: US Animal Health Association, 1992:78.

Notice to Readers

Update: Availability of Sulfadiazine — United States

Sulfadiazine is commonly used in combination with pyrimethamine to treat toxoplasmosis in patients with acquired immunodeficiency syndrome and in newborns with congenital infections. After the domestic commercial supplier of sulfadiazine discontinued marketing the drug in October 1992, CDC temporarily assumed distribution of sulfadiazine under a Food and Drug Administration Investigational New Drug protocol. A domestic commercial source was reestablished in August 1994, and CDC will no longer distribute sulfadiazine. Additional information is available from Eon Labs Manufacturing, Inc., 227-15 North Conduit Avenue, Laurelton, NY 11413; telephone (800) 366-1595 or (718) 276-8607.

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available on a paid subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone (202) 783-3238.

The data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. Inquiries about the *MMWR* Series, including material to be considered for publication, should be directed to: Editor, *MMWR* Series, Mailstop C-08, Centers for Disease Control and Prevention, Atlanta, GA 30333; telephone (404) 332-4555.

☆**U.S. Government Printing Office: 1994-533-178/05027 Region IV**