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Epidemiologic Notes and Reports

Otitis due to *Pseudomonas aeruginosa* Serotype 0:10 Associated with a Mobile Redwood Hot Tub System — North Carolina

From March 19 to April 2, 1982, six cases of *Pseudomonas aeruginosa*, serotype 0:10, infection occurred following common exposure to a hot tub in Orange County, North Carolina. Clinical illness included severe hemorrhagic external otitis, which, although commonly associated with swimming pools, has not been previously reported in the literature for whirlpool/spa settings.

Among 24 members of a university coeducational fraternity who used the implicated tub from March 26 to 29, two had simple dermatitis, and four developed severe external otitis, one of whom, a 19-year-old male, had concurrent cellulitis of the chest wall and thigh. He was hospitalized and treated with intravenous tobramycin for 4 days. His infection began as an area of erythema approximately 1-1/2 inches in diameter below the left nipple, accompanied by tender left axillary adenopathy and a pustule below the right nipple. The patient also noted severe pain and drainage from his left ear. Cultures from the chest pustule and the draining left ear were positive for *P. aeruginosa* serotype 0:10 (resistant to cephalothin, ampicillin, tetracycline, and trimethoprim-sulfamethoxazole and sensitive to gentamicin and carbenicillin). His symptoms began 48 hours after last exposure to the tub. The three other persons with severe external otitis that began within 48 hours of last exposure to the tub visited the student health service for treatment. In two of those, disease was bilateral and was associated with profound erythema or bloody discharge. The first had onset on March 27; the other, with onset on March 29, had a positive culture of ear drainage for *P. aeruginosa* of the same resistance pattern as the 19-year-old male. Neither responded to topical antibiotics, but both were treated successfully with intramuscular gentamicin.

A survey of fraternity members showed an association of illness with exposure to the tub, which was rented and used from March 26 to 29. Of 15 students who responded to a questionnaire, five (described above) met the case definition of ear infection or skin rash developing within 7 days after exposure to this tub. Total duration of exposure to the tub over the 4-day period was significantly associated with illness. Patients had a mean duration of 10.2 hours exposure; non-patients had a mean duration of 5.1 hours exposure ($t = 2.83$, $p < 0.02$). Only one of the five patients had exposure to another recreational water supply, spa, or whirlpool.

The hot tub in question was a portable, self-contained unit constructed of redwood; it measured approximately 6 feet in diameter by 4 feet deep, and held 700 gallons. It was mounted on a trailer for easy transport and had terraced observation decks above and below. The tub was filled with city water, supplied through a garden hose. A recirculation system with a pump, hair trap, dual filter, continuous-feed brominating system, air-introduction port (for a bubbling effect), and propane-fueled heating system were built in. Water could be drained to surrounding

Otitis – Continued

areas through a port in its base. Temperature was usually maintained at 104 F (40 C).

Inspection and culturing of the tub on April 15, after a previous night's usage at another fraternity, showed a pH 7.6 and free bromine level of < 0.5 parts per million (ppm). Of 12 environmental swabs of the tub, four were positive for *P. aeruginosa* serotype O:10. No other serotypes were identified in the specimens. The positive sites included a recirculation port, two areas of the dual filter, and filter intake line.

Procedures involved in maintaining and using the tub were reviewed. Usage peaked during the four evenings, when 15 or more persons at a time were in the tub. Despite written instructions to check the free-bromine level every four hours, water sampling was performed only once before use each day. The tub was emptied and rinsed with water from a garden hose daily, and filters were sprayed with water on March 27 and 28. No hyperbromination or scrubbing of internal surfaces was performed.

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Editorial Note: This episode points out the public health risks associated with a hot tub system rented by individuals not trained in its appropriate maintenance and monitoring of pH and bromine (or chlorine) levels. Prior outbreaks of *P. aeruginosa* dermatitis associated with heated whirlpools have generally involved serotype O:11. In most cases, rash was self-limited and resolved within 7 days of onset without antimicrobial therapy. Otitis occurred at low frequencies in two outbreaks (*1,2*). The illness reported here is unusually severe for pool-associated *P. aeruginosa* infection, and investigations indicated duration of exposure as a significant risk factor. After reviewing guidelines for hot tub use, hyperchlorination of the hot tub was instituted before each use. Whether serotype O:10 may represent a more invasive form of *P. aeruginosa* or whether other factors such as prolonged exposure may have contributed to the development of this spectrum of infection is undetermined at present.

Conditions relating to the design and use of whirlpools and hot tubs present certain sanitation problems often favorable for *P. aeruginosa* (*3*). Water temperature is usually 104 F-108 F (40 C- 42.2 C), and a high bather load often markedly reduces free-chlorine and -bromine levels. Aeration and agitation of water can also quickly deplete disinfectant residuals. Chlorine or bromine should be maintained at a free residual level of 1.5 ppm. Filtration equipment should be inspected and serviced regularly (*4*).

References

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2. Washburn J, Jacobson JA, Marston E, Thorsen B. *Pseudomonas aeruginosa* rash associated with a whirlpool. JAMA 1976;235:2205-7.
3. Kush BJ, Hoadley AW. A preliminary survey of the association of *Pseudomonas aeruginosa* with commercial whirlpool bath waters. Am J Public Health 1980;70: 279-81.
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Sporotrichosis Associated with Wisconsin Sphagnum Moss

On February 2, 1981, the Wisconsin Division of Health, Bureau of Community Health and Prevention (BCHP), was notified of a diagnosis of sporotrichosis in two brothers employed at a garden center in southeastern Wisconsin. An investigation of the garden center by the BCHP revealed two additional cases of sporotrichosis among the employees. All four cases involved male high school students, aged 16 and 17, who worked part-time at the garden center. Each

Sporotrichosis — Continued

had developed an ulcerating lesion on his hand or wrist during December 1980 and was initially treated with antibiotics without resolution. In three of the cases, non-tender ascending lymphangitis subsequently developed. Swabs of the lesions were sent to local hospital laboratories for fungus culture; two were positive for *Sporothrix schenckii.* All four individuals were successfully treated with potassium iodide.

The garden center consists of a retail store and wholesale greenhouse and employs approximately 80 people. Sixteen workers made approximately 1,000 gravesprays* during the months of November and December 1980. The sphagnum moss used was harvested from bogs located in central Wisconsin and was purchased from one wholesale dealer.

Of seven male workers regularly involved in making gravesprays, four developed sporotrichosis. The four ill workers were younger than the other three (mean age 16.5 vs. 31.8 years), had been employed for a shorter time (mean duration of employment 5.5 vs. 134 months), and wore gloves less often. Of three additional male employees who occasionally helped with the production of gravesprays and six female employees who were involved in final decorative preparations, none developed sporotrichosis. In an investigation of a local cemetery where 12 employees produce 2,000-3,000 gravesprays per autumn using sphagnum moss purchased from the same Wisconsin supplier, no additional cases were noted. Samples of the sphagnum moss used in December during the gravespray production at the garden center and tested at the Mycology Laboratory, Wisconsin State Laboratory of Hygiene, were culture-positive for *S. schenckii.* Additional samples of sphagnum moss from fresh bags at the garden center, from the cemetery production site, and from another local garden center were culture negative.

Reported by PL Remington, JM Vergeront, MD, Bureau of Community Health and Prevention, JP Davis, MD, State Epidemiologist, Wisconsin State Dept of Health and Social Svcs; Respiratory and Special Pathogens Br, Bacterial Diseases Div, Center for Infectious Diseases, CDC.

Editorial Note: Sporotrichosis is a well-described, yet uncommon, chronic infection caused by *S. schenckii,* a dimorphic fungus present worldwide in soil, plants, and decaying vegetation. Some of the outbreaks reported among florists (*1*) and nursery and forestry workers (*2,3*) have been associated with sphagnum moss grown in Wisconsin (*2-4*). Central Wisconsin, one of the largest areas of sphagnum-moss production in the nation, supplies moss for horticultural use throughout the United States and Japan. Although *S. schenckii* has not been cultured from the Wisconsin bogs where the moss grows, this outbreak demonstrates that positive cultures can be obtained from the moss at its point of usage.

Traumatic inoculation from the fungus results from handling contaminated articles such as wood, rose bushes, or sphagnum moss. Typically, lymphocutaneous sporotrichosis appears after a 1- to 12-week incubation period; it is characterized by a painless papule, usually on an upper extremity, which enlarges and often ulcerates. Subsequently, multiple painless nodules may appear along the route of lymphatic drainage of the original lesion. Sporotrichosis is rarely associated with systemic symptoms. Misdiagnosis of isolated cases has resulted in prolonged antibiotic therapy with significant morbidity and cost to patients (*5*). The diagnosis of sporotrichosis may be made on clinical grounds alone and can be confirmed by culturing *S. schenckii* from a lesion. Lymphocutaneous sporotrichosis is effectively treated with potassium iodide; antifungal agents are reserved for extracutaneous involvement.

This outbreak reconfirms sphagnum moss as a vehicle for sporotrichosis and suggests that workers in contact with the moss may reduce their risk of acquiring disease by wearing protec-

*A decorative winter covering for grave sites, constructed by weaving balsam boughs through a matting of water-soaked sphagnum moss.

Sporotrichosis — Continued

tive clothing. It also emphasizes the need for physicians to consider the possibility of sporotrichosis when patients present non-healing ulcerating lesions on their extremities.

References

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Typhoid Fever — Michigan

During October and November 1981, 18 cases of typhoid fever were diagnosed in Jackson, Michigan, among 310 United Way volunteers who consumed a luncheon served at a community banquet hall on October 8, 1981. Although no specific food could be incriminated, a probable chronic carrier of *Salmonella typhi* was identified among the food handlers who prepared the luncheon.

(Continued on page 549)

TABLE I. Summary—cases of specified notifiable diseases, United States

Disease	40th Week Ending			Cumulative, First 40 Weeks		
	October 9, 1982	October 10, 1981	Median 1977-1981	October 9, 1982	October 10, 1981	Median 1977-1981
Aseptic meningitis	268	307	307	6,191	7,210	5,492
Brucellosis	2	3	3	121	125	136
Encephalitis: Primary (arthropod-borne & unspec.)	32	45	35	980	1,113	848
Post-infectious	-	4	4	48	74	167
Gonorrhea: Civilian	13,065	21,089	21,145	723,787	772,366	766,183
Millitary	255	543	543	20,508	21,879	21,006
Hepatitis: Type A	386	493	610	16,932	19,224	22,209
Type B	317	482	310	16,045	15,566	12,683
Non A, Non B	42	N	N	1,680	N	N
Unspecified	155	237	222	6,941	8,360	7,857
Legionellosis	16	N	N	406	N	N
Leprosy	2	7	6	148	206	133
Malaria	4	35	28	796	1,121	581
Measles (rubeola)	63	28	83	1,350	2,674	12,957
Meningococcal infections: Total	33	45	34	2,284	2,765	2,078
Civilian	32	45	34	2,271	2,754	2,060
Military	1	-	-	13	11	16
Mumps	45	90	91	4,303	3,452	11,440
Pertussis	44	38	38	1,159	961	1,300
Rubella (German measles)	13	29	42	2,045	1,826	10,825
Syphilis (Primary & Secondary): Civilian	538	617	512	24,978	23,508	18,906
Military	12	3	3	338	289	242
Tuberculosis	397	549	549	19,574	20,693	21,234
Tularemia	6	13	5	199	218	161
Typhoid fever	10	41	12	306	436	391
Typhus fever, tick-borne (RMSF)	19	12	16	905	1,103	1,036
Rabies, animal	92	123	118	4,834	5,900	3,965

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1982		Cum. 1982
Anthrax	-	Poliomyelitis: Total	3
Botulism	58	Paralytic	3
Cholera	-	Psittacosis (Mo. 2, Tex, 1, Ariz 3)	95
Congenital rubella syndrome	5	Rabies, human	-
Diphtheria	2	Tetanus	64
Leptospirosis (Mo. 1, Ark. 1)	46	Trichinosis	74
Plague (Utah 1)	17	Typhus fever, flea-borne (endemic, murine) (Tex. 2)	33

TABLE III. Cases of specified notifiable diseases, United States, weeks ending October 9, 1982 and October 10, 1981 (40th week)

Reporting Area	Aseptic Menin-gitis	Brucel-losis	Encephalitis: Primary	Encephalitis: Post-in-fectious	Gonorrhea (Civilian)	Gonorrhea (Civilian)	Hepatitis (Viral), by type: A	Hepatitis (Viral), by type: B	Hepatitis (Viral), by type: NA,NB	Hepatitis (Viral), by type: Unspeci-fied	Legionel-losis	Leprosy
	1982	Cum. 1982	Cum. 1982	Cum. 1982	Cum. 1982	Cum. 1981	1982	1982	1982	1982	1982	Cum. 1982
UNITED STATES	268	121	980	48	723,787	772,366	386	317	42	155	16	148
NEW ENGLAND	19	3	36	5	17,807	19,065	7	30	3	8	2	1
Maine	3	-	-	-	907	999	-	2	-	-	-	-
N.H.	3	-	5	-	524	689	-	1	-	-	-	-
Vt.	-	-	-	-	332	327	2	-	-	-	2	-
Mass.	9	-	14	-	8,144	8,073	3	9	-	3	-	-
R.I.	2	-	-	1	1,177	1,109	1	1	1	-	-	-
Conn.	2	3	17	4	6,723	7,868	1	17	2	5	-	1
MID. ATLANTIC	42	3	105	10	92,003	92,897	55	53	7	12	4	9
Upstate N.Y.	16	3	40	3	15,278	15,596	9	13	3	1	-	1
N.Y. City	2	-	16	-	37,344	38,292	15	12	-	6	-	6
N.J.	12	-	20	-	16,958	17,736	14	20	4	2	-	1
Pa.	12	-	29	7	22,423	21,273	17	8	-	3	4	1
E.N. CENTRAL	76	1	219	10	98,747	115,603	87	67	2	17	6	3
Ohio	37	1	87	4	28,038	36,207	22	22	1	4	5	-
Ind.	4	-	60	3	12,585	9,962	37	16	-	5	-	-
Ill.	-	-	12	1	23,411	33,436	2	4	1	-	-	3
Mich.	35	-	55	-	25,253	25,371	26	25	-	8	1	-
Wis.	-	-	5	2	9,460	10,627	-	-	-	-	-	-
W.N. CENTRAL	11	15	75	4	34,714	36,281	19	10	5	3	1	4
Minn.	-	1	27	1	5,040	5,556	3	-	1	-	-	2
Iowa	1	4	34	1	3,652	3,986	1	1	-	-	-	-
Mo.	4	4	6	-	16,611	16,873	5	3	2	1	-	1
N. Dak.	-	-	-	-	460	461	-	-	-	-	-	-
S. Dak.	-	1	-	1	939	1,007	1	-	-	-	-	1
Nebr.	-	2	4	-	2,064	2,733	3	2	1	-	1	-
Kans.	6	3	4	1	5,948	5,665	6	4	1	2	-	-
S. ATLANTIC	64	23	154	8	191,587	190,059	48	74	6	19	3	9
Del.	-	-	-	-	3,048	3,070	-	1	-	1	-	-
Md.	3	-	20	-	23,809	22,327	1	8	1	1	-	3
D.C.	1	-	-	-	11,362	10,827	-	-	-	-	-	-
Va.	18	7	28	1	15,149	17,507	1	6	1	1	1	1
W. Va.	-	-	15	-	2,197	2,901	3	1	-	-	-	-
N.C.	7	-	22	1	30,564	29,006	2	6	-	5	-	-
S.C.	-	2	-	-	18,905	18,503	4	7	-	-	-	-
Ga.	3	3	14	-	36,994	39,538	17	12	-	-	-	1
Fla.	32	11	55	6	49,559	46,380	20	33	4	11	2	4
E.S. CENTRAL	13	11	52	2	63,846	64,497	29	17	6	3	-	-
Ky.	3	-	1	-	8,607	7,879	17	6	-	3	-	-
Tenn.	4	6	26	-	25,263	24,433	4	8	3	-	-	-
Ala.	6	4	15	2	18,675	19,597	6	3	3	-	-	-
Miss.	-	1	10	-	11,301	12,588	2	-	-	-	-	-
W.S. CENTRAL	30	37	164	1	100,154	101,953	66	32	-	72	-	25
Ark.	-	7	16	-	8,390	7,765	1	3	-	7	-	-
La.	-	8	16	-	18,741	17,822	11	4	-	1	-	-
Okla.	3	5	33	-	11,181	10,959	7	4	-	5	-	-
Tex.	27	17	99	1	61,842	65,407	47	21	-	59	-	25
MOUNTAIN	11	-	35	3	24,786	30,202	53	19	6	15	-	2
Mont.	-	-	-	-	1,015	1,106	1	-	-	-	-	-
Idaho	1	-	-	-	1,205	1,357	1	-	-	-	-	1
Wyo.	-	-	-	-	735	762	-	-	-	-	-	-
Colo.	5	-	17	1	6,722	8,090	9	5	2	8	-	-
N. Mex.	-	-	1	-	3,334	3,320	5	-	-	-	-	-
Ariz.	-	-	8	-	6,478	8,933	33	12	4	6	-	-
Utah	5	-	5	2	1,212	1,513	2	1	-	-	-	1
Nev.	-	-	4	-	4,085	5,121	2	1	-	1	-	-
PACIFIC	2	28	140	5	100,143	121,809	22	15	7	6	-	95
Wash.	1	1	11	-	8,816	10,092	1	4	-	4	-	7
Oreg.	-	-	3	-	6,168	7,187	17	11	6	2	-	1
Calif.	U	26	118	5	80,638	99,004	U	U	U	U	U	65
Alaska	-	1	5	-	2,584	3,118	-	-	-	-	-	1
Hawaii	1	-	3	-	1,937	2,408	4	-	1	-	-	21
Guam	U	-	-	-	97	91	U	U	U	U	U	-
P.R.	U	-	1	-	2,090	2,526	U	U	U	U	U	1
V.I.	-	-	-	-	181	183	-	-	-	-	-	-
Pac. Trust Terr.	U	-	-	-	297	342	U	U	U	U	U	13

N: Not notifiable U: Unavailable

TABLE III. (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending October 9, 1982 and October 10, 1981 (40th week)

Reporting Area	Malaria		Measles (Rubeola)			Meningococcal Infections (Total)		Mumps		Pertussis	Rubella		
	1982	Cum. 1982	1982	Cum. 1982	Cum. 1981	1982	Cum. 1982	1982	Cum. 1982	1982	1982	Cum. 1982	Cum. 1981
UNITED STATES	4	796	63	1,351	2,674	33	2,284	45	4,303	44	13	2,045	1,826
NEW ENGLAND	-	41	-	15	79	1	118	-	180	1	1	20	117
Maine	-	-	-	-	5	-	9	-	41	-	-	-	33
N.H.	-	1	-	3	6	-	15	-	15	-	-	10	49
Vt.	-	-	-	2	3	-	8	-	7	-	-	-	-
Mass.	-	24	-	4	55	-	30	-	85	1	-	5	23
R.I.	-	3	-	-	-	-	13	-	15	-	-	1	-
Conn.	-	13	-	6	10	1	43	-	17	-	1	4	12
MID. ATLANTIC	2	134	3	162	843	9	408	6	277	7	2	101	217
Upstate N.Y.	-	25	2	112	209	3	143	5	66	6	-	49	103
N.Y. City	-	52	1	42	87	2	77	-	46	1	1	33	54
N.J.	1	29	-	4	58	-	81	1	41	-	1	18	47
Pa.	1	28	-	4	489	4	107	-	124	-	-	1	13
E.N. CENTRAL	-	57	-	76	81	7	277	19	2,207	23	3	177	382
Ohio	-	12	-	1	16	4	98	10	1,576	5	-	-	3
Ind.	-	3	-	2	9	-	28	-	37	2	1	28	132
Ill.	-	12	-	23	23	-	73	3	181	14	1	65	96
Mich.	-	26	-	50	30	3	64	5	308	1	-	49	34
Wis.	-	4	-	-	3	-	14	1	105	1	1	35	117
W.N. CENTRAL	-	19	-	49	10	1	102	4	571	3	1	59	78
Minn.	-	2	-	-	3	-	27	-	437	-	-	5	7
Iowa	-	6	-	-	1	-	9	-	32	1	-	-	4
Mo.	-	5	-	2	1	-	26	-	17	-	-	38	2
N. Dak.	-	1	-	-	-	-	6	-	-	-	-	-	-
S. Dak.	-	-	-	-	-	-	4	-	1	-	-	1	-
Nebr.	-	3	-	3	4	-	12	-	-	-	-	-	1
Kans.	-	2	-	44	1	1	18	4	84	2	1	15	64
S. ATLANTIC	1	114	-	43	427	12	485	8	262	5	2	80	134
Del.	-	4	-	-	-	-	-	-	13	-	-	1	1
Md.	1	19	-	3	5	-	34	-	29	-	-	34	1
D.C.	-	4	-	1	1	-	2	-	-	-	-	-	-
Va.	-	35	-	14	9	3	58	1	35	-	-	13	6
W. Va.	-	7	-	3	9	-	9	2	91	-	-	1	22
N.C.	-	3	-	-	3	3	95	3	16	2	-	1	5
S.C.	-	4	-	-	2	-	54	-	16	-	-	1	8
Ga.	-	15	-	-	111	5	100	1	16	1	1	13	36
Fla.	-	23	-	22	287	1	133	1	46	2	1	16	55
E.S. CENTRAL	-	8	-	7	5	-	145	1	50	2	1	46	35
Ky.	-	5	-	1	1	-	24	1	17	-	1	28	21
Tenn.	-	-	-	6	2	-	63	-	19	1	-	2	13
Ala.	-	-	-	-	2	-	47	-	8	-	-	-	1
Miss.	-	3	-	-	-	-	11	-	6	1	-	16	-
W.S. CENTRAL	-	58	60	110	852	2	278	6	188	1	2	106	163
Ark.	-	4	-	-	17	-	13	-	7	-	-	1	3
La.	-	4	-	2	4	-	58	-	6	-	-	1	9
Okla.	-	8	-	29	5	2	27	-	-	-	-	3	1
Tex.	-	42	60	79	826	-	180	6	175	1	2	101	150
MOUNTAIN	-	27	-	19	35	1	102	-	89	-	1	78	91
Mont.	-	1	-	-	-	-	4	-	3	-	-	5	3
Idaho	-	2	-	-	1	-	7	-	4	-	-	6	4
Wyo.	-	-	-	1	1	-	5	-	2	-	-	7	10
Colo.	-	11	-	6	10	-	42	-	16	-	-	6	30
N. Mex.	-	3	-	-	8	1	15	-	-	-	-	6	5
Ariz.	-	7	-	12	5	-	18	-	38	-	-	14	20
Utah	-	3	-	-	-	-	9	-	20	-	1	22	8
Nev.	-	-	-	-	10	-	2	-	6	-	-	12	11
PACIFIC	1	338	-	870	342	-	369	1	479	2	-	1,378	609
Wash.	1	19	-	40	3	-	42	-	64	2	-	38	89
Oreg.	-	13	-	19	5	-	69	-	-	-	-	6	53
Calif.	U	301	U	805	327	U	243	U	395	U	U	1,321	451
Alaska	-	1	-	1	-	-	11	1	9	-	-	5	1
Hawaii	-	4	-	5	7	-	4	-	11	-	-	8	15
Guam	U	1	U	6	6	U	2	U	3	U	U	2	2
P.R.	U	4	U	113	280	U	8	U	57	U	U	11	4
V.I.	-	-	-	-	24	-	-	-	3	-	-	-	1
Pac. Trust Terr.	U	-	U	-	1	U	2	U	5	U	U	-	1

U: Unavailable

TABLE III. (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending October 9, 1982 and October 10, 1981 (40th week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Tuberculosis		Tula-remia	Typhoid Fever		Typhus Fever (Tick-borne) (RMSF)		Rabies, Animal
	Cum. 1982	Cum. 1981	1982	Cum. 1982	Cum. 1982	1982	Cum. 1982	1982	Cum. 1982	Cum. 1982
UNITED STATES	24,978	23,508	397	19,574	199	10	306	19	905	4,834
NEW ENGLAND	442	453	2	535	6	1	17	-	9	38
Maine	4	5	-	46	-	-	-	-	-	26
N.H.	1	12	-	20	-	-	-	-	1	1
Vt.	2	14	-	13	-	-	2	-	-	1
Mass.	300	297	2	339	6	1	13	-	5	5
R.I.	19	26	-	24	-	-	-	-	2	-
Conn.	116	99	-	93	-	-	2	-	1	5
MID. ATLANTIC	3,409	3,426	102	3,280	7	2	55	3	37	167
Upstate N.Y.	334	325	16	568	7	-	7	-	12	86
N.Y. City	2,053	2,044	40	1,236	-	2	29	-	1	-
N.J.	464	485	16	643	-	-	11	-	13	16
Pa.	558	572	30	833	-	-	8	3	11	65
E.N. CENTRAL	1,338	1,768	93	2,991	1	1	24	3	80	488
Ohio	238	228	9	499	-	-	11	3	75	72
Ind.	156	234	25	379	-	1	1	-	-	70
Ill.	645	939	50	1,274	-	-	3	-	5	259
Mich.	225	293	8	682	-	-	8	-	-	5
Wis.	74	74	1	157	1	-	1	-	-	82
W.N. CENTRAL	427	510	13	571	30	-	14	-	33	1,020
Minn.	96	160	2	104	-	-	6	-	-	174
Iowa	24	21	1	57	2	-	1	-	4	326
Mo.	248	286	8	275	20	-	4	-	10	101
N. Dak.	7	7	-	12	-	-	-	-	-	85
S. Dak.	1	2	2	26	1	-	-	-	4	88
Nebr.	11	7	-	23	3	-	2	-	2	111
Kans.	40	27	-	74	4	-	1	-	13	135
S. ATLANTIC	6,884	6,215	74	4,065	11	3	40	7	492	893
Del.	19	13	2	38	-	-	-	-	-	2
Md.	367	461	-	459	1	-	9	1	48	44
D.C.	375	514	7	161	-	-	-	-	-	-
Va.	466	529	13	440	3	1	4	1	72	470
W. Va.	22	17	3	126	-	1	4	-	8	37
N.C.	559	492	9	654	-	1	2	3	208	62
S.C.	420	428	9	386	6	-	3	-	104	51
Ga.	1,438	1,548	8	638	-	-	-	-	47	167
Fla.	3,218	2,213	23	1,163	1	-	18	2	5	60
E.S. CENTRAL	1,755	1,552	42	1,796	8	-	17	5	85	559
Ky.	98	85	10	475	-	-	2	-	1	114
Tenn.	499	564	12	577	6	-	3	3	54	309
Ala.	656	452	12	492	-	-	9	1	14	129
Miss.	502	451	8	252	2	-	3	1	16	7
W.S. CENTRAL	6,610	5,663	53	2,405	101	3	30	1	152	934
Ark.	163	124	10	274	62	-	3	-	26	126
La.	1,489	1,293	8	354	3	-	3	-	2	31
Okla.	143	122	-	273	28	1	3	-	71	163
Tex.	4,815	4,124	35	1,504	8	2	21	1	53	614
MOUNTAIN	623	583	11	545	26	-	13	-	11	250
Mont.	5	11	1	35	3	-	-	-	4	84
Idaho	24	17	1	26	1	-	-	-	2	9
Wyo.	16	9	-	2	5	-	-	-	1	21
Colo.	172	172	1	68	4	-	3	-	1	45
N. Mex.	149	103	2	98	2	-	-	-	1	23
Ariz.	145	146	2	226	-	-	7	-	-	48
Utah	19	22	-	36	11	-	2	-	-	17
Nev.	93	103	4	54	-	-	1	-	2	3
PACIFIC	3,490	3,338	7	3,386	9	-	96	-	6	485
Wash.	128	140	4	220	1	-	6	-	-	7
Oreg.	90	83	-	132	1	-	4	-	1	3
Calif.	3,176	3,049	U	2,741	6	U	82	U	5	396
Alaska	11	11	-	74	1	-	1	-	-	79
Hawaii	85	55	3	219	-	-	3	-	-	-
Guam	1	-	U	36	-	U	-	U	-	-
P.R.	547	524	U	319	-	U	2	U	-	43
V.I.	21	15	-	1	-	-	-	-	-	-
Pac. Trust Terr.	-	-	U	91	-	U	-	U	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending October 9, 1982 (40th week)

Reporting Area	All Causes, By Age (Years)						P&I** Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	663	432	154	37	18	22	43
Boston, Mass.	174	95	54	9	7	9	17
Bridgeport, Conn.	39	26	6	6	1	-	4
Cambridge, Mass.	25	20	3	2	-	-	2
Fall River, Mass.	34	21	11	2	-	-	-
Hartford, Conn.	83	51	16	2	7	7	3
Lowell, Mass.	18	11	5	1	1	-	-
Lynn, Mass.	19	14	5	-	-	-	-
New Bedford, Mass	25	21	3	1	-	-	2
New Haven, Conn.	43	29	6	5	1	2	4
Providence, R.I.	57	37	14	2	1	3	2
Somerville, Mass.	11	9	2	-	-	-	-
Springfield, Mass.	44	30	10	3	-	1	4
Waterbury, Conn.	24	18	5	1	-	-	1
Worcester, Mass.	67	50	14	3	-	-	4
MID. ATLANTIC	2,454	1,647	513	162	64	67	83
Albany, N.Y.	60	36	15	4	1	4	1
Allentown, Pa.	18	15	3	-	-	-	-
Buffalo, N.Y.	119	76	30	6	5	2	10
Camden, N.J.	22	11	5	4	2	-	1
Elizabeth, N.J.	20	17	2	1	-	-	-
Erie, Pa.†	27	22	4	-	-	1	-
Jersey City, N.J.	53	37	12	1	3	-	-
N.Y. City, N.Y.	1,372	913	282	105	32	40	37
Newark, N.J.	69	43	14	7	4	1	5
Paterson, N.J. §	23	19	-	1	1	1	1
Philadelphia, Pa.†	205	129	47	15	6	8	12
Pittsburgh, Pa.†	74	49	20	2	2	1	2
Reading, Pa.	34	26	8	-	-	-	3
Rochester, N.Y.	126	90	23	7	2	4	3
Schenectady, N.Y.	34	25	5	2	1	1	1
Scranton, Pa.†	19	17	2	-	-	-	1
Syracuse, N.Y.	91	62	18	4	3	4	1
Trenton, N.J.	46	29	15	2	-	-	-
Utica, N.Y.	21	15	3	1	2	-	2
Yonkers, N.Y.	21	16	5	-	-	-	3
E.N. CENTRAL	2,276	1,400	545	151	82	97	57
Akron, Ohio	66	44	16	-	3	3	-
Canton, Ohio	47	24	16	3	2	2	1
Chicago, Ill	513	288	141	49	19	16	7
Cincinnati, Ohio	135	80	34	10	4	7	15
Cleveland, Ohio	178	98	44	13	8	15	2
Columbus, Ohio	137	85	34	6	6	6	3
Dayton, Ohio	104	69	25	5	5	-	2
Detroit, Mich.	271	167	53	24	15	12	3
Evansville, Ind.	36	27	6	1	1	1	3
Fort Wayne, Ind.	53	37	12	1	2	1	1
Gary, Ind.	22	8	8	4	-	2	-
Grand Rapids, Mich.	62	40	11	4	3	4	1
Indianapolis, Ind.	169	97	49	7	3	13	1
Madison, Wis.	53	28	15	6	1	3	2
Milwaukee, Wis.	134	89	34	5	1	5	6
Peoria, Ill.	34	24	5	2	2	1	2
Rockford, Ill.	44	32	10	2	-	-	3
South Bend, Ind. §	43	39	-	1	1	1	2
Toledo, Ohio	109	81	18	6	2	2	3
Youngstown, Ohio	66	43	14	2	4	3	-
W.N. CENTRAL	734	505	139	34	29	27	43
Des Moines, Iowa	81	61	9	5	4	2	2
Duluth, Minn.	34	26	7	-	1	-	4
Kansas City, Kans.	37	20	11	3	2	1	1
Kansas City, Mo.	119	79	26	3	2	9	5
Lincoln, Nebr.	47	42	3	-	2	-	6
Minneapolis, Minn.	86	56	18	3	2	7	1
Omaha, Nebr.	80	55	20	3	2	-	7
St. Louis, Mo.	132	83	24	12	6	7	11
St. Paul, Minn.	66	49	9	3	4	1	1
Wichita, Kans.	52	34	12	2	4	-	5
S. ATLANTIC	1,048	674	219	76	37	40	36
Atlanta, Ga.	122	71	30	15	3	3	6
Baltimore, Md.	208	113	59	18	14	4	2
Charlotte, N.C.	46	25	8	5	3	5	1
Jacksonville, Fla.	90	53	27	4	2	4	3
Miami, Fla.	103	69	21	8	2	3	2
Norfolk, Va.	57	32	17	5	-	3	4
Richmond, Va.	82	51	15	8	3	5	4
Savannah, Ga.	39	22	12	2	2	1	5
St. Petersburg, Fla.	78	67	10	-	-	1	3
Tampa, Fla.	69	45	8	5	4	7	4
Washington, D.C. §	106	94	1	3	2	4	2
Wilmington, Del.	48	32	11	3	2	-	-
E.S. CENTRAL	722	438	182	44	29	29	17
Birmingham, Ala.	117	63	34	5	7	8	-
Chattanooga, Tenn.	54	40	8	5	1	-	2
Knoxville, Tenn.	38	28	8	-	1	1	2
Louisville, Ky.	116	62	38	10	2	4	4
Memphis, Tenn.	173	109	39	13	8	4	5
Mobile, Ala.	67	35	18	5	2	7	2
Montgomery, Ala.	52	36	9	2	2	3	1
Nashville, Tenn.	105	65	28	4	6	2	1
W.S. CENTRAL	1,290	717	327	110	79	57	37
Austin, Tex.	63	43	11	5	2	2	4
Baton Rouge, La.	39	24	7	3	2	3	2
Corpus Christi, Tex.	44	25	13	1	3	2	-
Dallas, Tex.	184	93	51	13	9	18	-
El Paso, Tex.	39	24	8	5	1	1	3
Fort Worth, Tex.	85	61	16	3	2	3	7
Houston, Tex.	383	190	102	44	37	10	11
Little Rock, Ark.	53	28	17	3	2	3	3
New Orleans, La.	110	58	35	11	5	1	-
San Antonio, Tex.	144	76	36	15	10	7	5
Shreveport, La.	70	46	13	4	4	3	-
Tulsa, Okla.	76	49	18	3	2	4	2
MOUNTAIN	605	362	118	61	24	40	25
Albuquerque, N.Mex.	62	35	13	10	1	3	3
Colo. Springs, Colo.	39	21	6	7	1	4	4
Denver, Colo.	122	68	24	7	3	20	6
Las Vegas, Nev.	61	34	17	6	3	1	-
Ogden, Utah	23	16	2	1	1	3	3
Phoenix, Ariz.	144	91	23	18	9	3	3
Pueblo, Colo.	26	14	9	2	1	-	2
Salt Lake City, Utah	45	28	9	4	2	2	-
Tucson, Ariz.	83	55	15	6	3	4	4
PACIFIC	1,700	1,118	348	125	57	49	77
Berkeley, Calif.	24	20	3	1	-	-	1
Fresno, Calif.	74	53	11	3	5	2	-
Glendale, Calif.	38	32	3	1	-	2	1
Honolulu, Hawaii	65	37	16	6	3	3	4
Long Beach, Calif.	101	65	25	8	2	1	7
Los Angeles, Calif.	574	365	119	51	22	16	24
Oakland, Calif.	65	43	16	4	1	1	3
Pasadena, Calif.	27	20	2	1	1	3	3
Portland, Oreg.	109	73	25	5	2	4	4
Sacramento, Calif. §	67	63	-	-	2	-	3
San Diego, Calif.	103	58	30	7	6	2	9
San Francisco, Calif.	125	76	30	11	3	5	-
San Jose, Calif.	132	84	24	15	6	3	7
Seattle, Wash.	122	81	28	7	2	4	4
Spokane, Wash.	50	30	12	4	2	2	4
Tacoma, Wash.	24	18	4	1	-	1	3
TOTAL	11,492††	7,293	2,545	800	419	428	418

* 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 4 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.

§ Data not available. Figures are estimates based on average of past 4 weeks.

Typhoid Fever — Continued

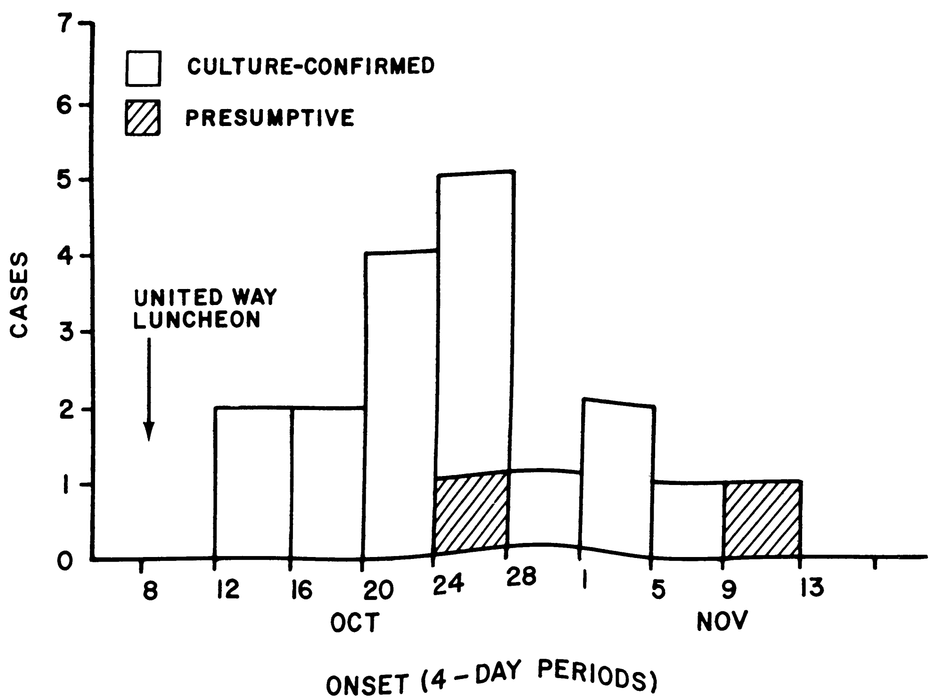
Dates of onset ranged from October 12 to November 11, 1981 (Figure 1), for an incubation period of 4 to 33 days (mean = 13.5). Older individuals tended to have shorter incubation periods. The attack rate was 5.8%. Sixteen of the 18 cases were confirmed by blood and/or stool culture. All isolates of *S. typhi* were phage type E_1 and were sensitive to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole.

All patients experienced fever (mean temperature 103.3 F [39.6 C]), fatigue, and headache, and most had chills, sweats, and anorexia; 39% reported diarrhea, and 33% had constipation. There were four relapses (rate = 22%) of which only one was symptomatic. No instances of gastrointestinal hemorrhage or perforation were reported. There were no deaths and no evidence of secondary transmission.

Self-administered questionnaires asking about foods eaten at the luncheon and subsequent illness were distributed to all attendees; 289 (93%) returned completed questionnaires. Food histories of the 16 culture-confirmed cases were compared with those of asymptomatic controls. Univariate testing did not identify any single food associated with illness. Multivariate logistic regression analysis (using different control groups and different weighting of responses and carried out in forward and backward stepwise fashion) also failed to incriminate any food item.

A probable chronic carrier of *S. typhi* was identified among the food handlers. This individual, an asymptomatic 68-year-old female with previously undiagnosed cholelithiasis, had participated in the preparation of all or most of the foods served. *S. typhi* of the same phage type and antimicrobial-sensitivity pattern as that obtained from cases was isolated from her rectal swab and all her stool specimens; the serum Vi antibody titer was 20. She subsequently

FIGURE 1. Cases of typhoid fever by date of onset — Jackson, Michigan, 1981



Typhoid Fever — Continued

underwent cholecystectomy in combination with high-dose amoxicillin therapy. Culture of the gallstone after antimicrobial therapy and all follow-up stool cultures have been negative.

Reported by D Ray, MPH, D Tribby, DVM, Jackson County Health Dept, J Eyster, PhD, S Coopes, W Hall, MD, H McGee, MPH, E Renshaw Jr, PhD, G Winter, N Hayner, MD, State Epidemiologist, Michigan Dept of Public Health; Field Services Div, Epidemiology Program Office, Enteric Diseases Br, Div of Bacterial Diseases, Center for Infectious Diseases, CDC.

Editorial Note: The incidence of typhoid fever in the United States has decreased dramatically over the past 50 years (*1*). About 350-600 cases have been reported annually since 1965 when the incidence rate stabilized. The majority of cases in the United States are now acquired overseas (*2*), the most common source countries being Mexico (50%) and India (15%).

Typhoid outbreaks, especially in communities, have occurred only rarely in the United States in recent years (*3*); contamination of food and water by a previously unrecognized chronic carrier is usually responsible. The carrier state is now rare in the United States, although its exact prevalence is unknown. Routine stool culturing of food handlers is considered unjustified (*4*).

Multivariate regression analysis can be useful in identifying the vehicle or vehicles in a foodborne outbreak. In this outbreak, however, the technique was not successful because of 1) the small number of cases, 2) minimal variation in food-consumption patterns resulting from the limited menu, and 3) unreliable food histories due to the extended period between transmission and the administration of the questionnaire.

References

1. CDC. Annual Summary 1980. MMWR 1981;29:12-7.
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False-Positive Blood Cultures Associated with Automated Blood-Culture Analyzers — Massachusetts

From July to September 1981, two Boston, Massachusetts, hospitals reported blood cultures positive for *Staphylococcus aureus* resulting from cross-contamination of the cultures on automated radiometric blood-culture analyzers. The reports follow.

Report No. 1: Between July 31 and August 6, 1981, 24 blood cultures from 12 patients at the Faulkner Hospital were positive for *S. aureus*, phage type 94/96. Since only one of the patients had a clinical illness compatible with *S. aureus* bacteremic infection, microbiology laboratory equipment and techniques were examined to identify a possible cause for the false-positive blood cultures. As part of the evaluation, tubing connecting the needles to both the flush and sampling circuits were cultured; both yielded *S. aureus* of the same phage type obtained from the contaminated blood cultures.

To confirm the possibility of cross-contamination on the Bactec 640 blood-culture analyzer, a blood-culture bottle was inoculated with *S. aureus* and processed routinely; bacteria from this bottle were transferred sequentially to test bottles of sterile culture medium sampled on the machine. Evaluation of the blood-culture analyzer by the manufacturer indicated that it was operating satisfactorily. Review of operating procedures for the machine in the laboratory revealed that several recommended operating and quality-control specifications had not been followed. After these procedures were corrected and the contaminated tubing was changed, the cross-contamination experiment was repeated and again resulted in transmission of bacte-

Blood Cultures — Continued

ria by the machine. Further examination of the machine by the manufacturer failed to identify a specific problem; after the analyzer was replaced, however, no further episodes of cross-contamination occurred.

Report No. 2: From September 16 to September 22, 1981, blood cultures from four patients at the Boston City Hospital became postive for oxacillin-resistant *S. aureus*. An investigation to identify a common source showed that only one patient was infected with this organism; the other three patients were not colonized and had not been exposed to other patients infected with this strain of *S. aureus*. The four blood cultures had been obtained the same day and processed sequentially on the Bactec 640 automated blood-culture analyzer; they became positive 2, 4, 7, and 8 days, respectively, after being obtained. During an experimental trial using a blood-culture bottle inoculated with the oxacillin-resistant *S. aureus*, cross-contamination was documented from the initial blood-culture bottle to three of nine bottles subsequently processed by the analyzer in which bubbles of culture medium were present in the neck of the bottle; cross-contamination did not occur to any of the nine bottles in which bubbles were not present.

Review of blood-culture data for the 7 months preceding this episode identified 20 additional episodes of probable cross-contamination; eight involved *S. aureus*; 10, *S. epidermidis*; one, *Escherichia coli*; and one, satellite-forming *Streptococcus*. In each instance, cross-contaminated cultures became positive later than the true positive blood cultures (mean 4.1 days compared with 1.6 days; $t=4.32$, $p < 0.001$). Cross-contamination episodes had occurred with all seven technicians who used the analyzer.

Review of laboratory procedures for the blood-culture analyzer indicated the machine was being properly maintained and that the needles were cleaned, checked, and sterilized according to the manufacturer's instructions. Examination of the analyzer by the manufacturer indicated malfunction of the needle sterilizer; after the sterilizing unit and computer board controlling its function were replaced, experimental cross-contamination no longer occurred on the unit, and no further episodes of cross-contamination occurred.

Reported by SA Weinstein, MPH, B Weinstein, MD, FO Escobar, BC Fine, MD, Faulkner Hospital, DE Craven, MD, DL Lichtenberg, K Browne, D Coffee, T Treadwell, MD, WR McCabe, MD, Maxwell Finland Laboratory for Infectious Diseases, Boston City Hospital, Boston, NJ Fiumara, MD, State Epidemiologist, Massachusetts State Dept of Public Health; Hospital Infections Program, Center for Infectious Diseases, CDC.

Editorial Note: False-positive blood cultures may create unnecessary concern for patients and physicians and may result in additional laboratory tests and costs and in unnecessary treatment of patients. Blood cultures in both hospitals were processed on analyzers that operate by detecting radioisotopically labeled gases produced by microorganisms growing in the special culture medium. The gases are sampled in each blood-culture bottle by two needles that simultaneously puncture the rubber diaphragm of the culture bottle; the gas in the space above the culture medium is flushed into the sampling needle by a mixture of inert gases entering the bottle through the other needle. After sampling each unit, the needles are withdrawn, and the tips are heat-sterilized automatically by the machine before being inserted into the next culture bottle for sampling. The problem resolved after replacement of the needle-sterilizing unit in the analyzer in one hospital and after replacement of the entire analyzer in the other.

The *Morbidity and Mortality Weekly Report* is published by the Centers for Disease Control, Atlanta, Georgia. The data in this report are provisional, based on weekly telegraphs 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.

The editor welcomes accounts on interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Send reports to: Attn: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

Blood Cultures — Continued

Radiometric blood-culture analyzers of the type used in these hospitals are used widely in hospital laboratories; they have been associated with clusters of false-positive blood cultures in the past (*1,2*). In one instance, cross-contamination apparently occurred because the needle probes on the machine were not changed, cleaned, and sterilized daily (*1*); in the other, the power unit and circuit boards controlling heat sterilization of the needle probes malfunctioned and had to be replaced (*2*). Cross-contamination with a variety of organisms apparently can occur, although this is the first documented report of cross-contamination with *S. aureus* on these machines. The problems were detected through a combination of surveillance and clinical judgment about the incompatability between culture results and patient illness. Report number 1 is also unique in that no specific malfunction of the machine could be identified, and contamination of the tubing attached to the needles occurred. The analyzer cannot sterilize tubing once contaminated. These reports also suggest that bubbles of media in the necks of the culture bottles may greatly increase the probability of cross-contamination.

In some laboratories, use of the radiometric blood-culture analyzers may decrease the time between obtaining a blood culture and detection of bacterial growth. Laboratory personnel must be aware that these machines can malfunction, allowing cross-contamination to occur. Prevention of these problems depends on carefully following recommended procedures for maintenance and operation of the machine and periodic review of laboratory log books to try to detect the occurrence of unusual clusters of positive blood cultures that might be caused by cross-contamination on the analyzer.

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