Staphylococcal Infections – Continued

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Editorial Note: Epidemic staphylococcal disease is an unusual occupational hazard outside of health care settings. Outbreaks similar to this one are reported to have occurred among members of high school football teams, and to have responded to similar control measures. These reports, however, involved persons with direct, violent, physical contact.

In this report, several epidemiologic features apparently contributed to the spread of disease among the river guides. Whitewater rafting is a seasonal sport; each spring, as the guides arrive, strains of *S. aureus* are undoubtedly introduced into the group by human carriers. The guides' constant exposure to river rafts and the associated trauma to their shins and ankles provide sites for inoculation of the organism and subsequent infection. It is particularly noteworthy that some of the same strains of *S. aureus* infecting the guides were readily recoverable from rafts after several hours of alternate submersion in the river and drying in fresh air and sunlight, even when cultured as long as 72 hours after the raft was last used. *S. aureus* is known to be resistant to drying and to be recoverable from environmental sources, such as dust, for long periods of time; however, such environmental sources of *S. aureus* are not usually believed to be epidemiologically important in transmission of infection and disease, especially in comparison with the potential for transmission from human disseminators (including auto-inoculation).

If persistence of the organism on the rafts and direct inoculation of traumatized skin surfaces by this route were the only mechanism of transmission in this outbreak, differences in the frequency of disease among companies with "communal" and "non-communal" living arrangements or among different river sites would not be expected. Differences do exist for each of these factors, as well as for association of disease among roommates in the "communal" facilities. The "communal" living arrangements apparently altered the epidemiology of the disease, perhaps by facilitating the selection and maintenance of more virulent strains of *S. aureus*, by promoting frequent transmission of staphylococci among roommates, or by providing other means of transmission of the organism to traumatized skin sites, i.e., auto-inoculation. Although factors facilitating such transmission were sought, none was identified. Company A's practice of randomly and frequently rotating the employees may have disseminated the more virulent strains of *S. aureus* to all river sites used by the company.

Hearing Protectors: Field Measurements

In 1977 and 1981, the National Institute for Occupational Safety and Health (NIOSH) conducted field investigations to determine the amount of noise reduction (attenuation) afforded to industrial workers who use earplugs. Tests of 420 workers at 15 industrial plants indicated that 50% of the workers received less than half the potential protection demonstrated in laboratory testing.

Earplug distributors label their products with noise-reduction indexes based on data from standard audiometric laboratory tests. Although earplugs can provide adequate protection from noise hazards, workers generally wear earplugs incorrectly; thus, distributors' estimates may greatly exceed the actual protection of earplugs.

The field investigations included evaluations of five general types of earplug design: twin-flanged (pre-formed in "small" and "regular" sizes); single-flanged (pre-formed in five sizes); acoustic wool (two types made of user-formed cotton-like material, one with a pre-formed

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plastic shroud); custom-molded (two types, one vented with a "noise filter"); and expandable acoustic foam (two types differing only in color).

Twenty-eight workers who used the same type of earplug were randomly selected at each plant. The attenuation provided by the earplug was audiometrically measured for each worker and was then plotted against the tested sound frequency (*1,2*). These results were compared with the results of previous laboratory tests of attenuation at the same frequencies, and, in most cases, revealed substantial differences between the attenuation values recorded in the field and those recorded in the laboratory.

The noise reduction afforded each worker was calculated using the attenuation value at each test frequency and a typical industrial noise spectrum adjusted according to a frequency contour (known as "A-weighting") approximating the human ear response (Table 1). Overall, the median reduction value was 13 decibels (dB) under actual working conditions versus 28 dB estimated from data provided by the distributors.

Reported by Div of Biomedical and Behavioral Science, National Institute for Occupation Safety and Health, CDC.

Editorial Note: There are many reasons for differences between the results of field and laboratory testing. Sizing, fit, and method of insertion are usually less than optimal in preformed and user-formed earplugs. Effectiveness of the custom-molded types depends on preparation of the impression materials and fit of the final mold. The expandable foam ear-

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

Disease	45th Week Ending			Cumulative, First 45 Weeks		
	November 13, 1982	November 14, 1981	Median 1977-1981	November 13, 1982	November 14, 1981	Median 1977-1981
Aseptic meningitis	221	215	176	7,851	8,458	6,756
Brucellosis	2	5	3	142	148	153
Encephalitis: Primary (arthropod-borne & unspec.)	22	32	28	1,228	1,303	1,048
Post-infectious	2	1	2	56	81	190
Gonorrhea: Civilian	15,304	17,153	19,202	825,246	869,298	869,298
Military	554	325	402	22,876	24,114	23,905
Hepatitis: Type A	461	489	573	19,445	21,690	25,203
Type B	412	434	314	18,456	17,698	14,203
Non A, Non B	44	N	N	1,983	N	N
Unspecified	170	218	218	7,648	9,354	8,984
Legionellosis	14	N	N	454	N	N
Leprosy	8	3	1	178	218	150
Malaria	14	11	14	911	1,221	665
Measles (rubeola)	27	50	88	1,525	2,803	13,128
Meningococcal infections: Total	59	68	41	2,544	3,033	2,246
Civilian	59	67	41	2,531	3,021	2,226
Military	-	1	-	13	12	17
Mumps	52	132	144	4,615	3,883	12,161
Pertussis	69	19	30	1,510	1,079	1,486
Rubella (German measles)	11	16	60	2,149	1,899	11,113
Syphilis (Primary & Secondary): Civilian	474	585	540	28,323	26,766	21,596
Military	9	5	5	388	334	272
Tuberculosis	469	467	484	22,173	23,400	23,767
Tularemia	2	2	2	227	238	173
Typhoid fever	7	9	11	347	514	453
Typhus fever, tick-borne (RMSF)	5	6	6	952	1,150	1,085
Rabies, animal	107	92	92	5,436	6,433	4,468

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1982		Cum. 1982
Anthrax	-	Poliomyelitis: Total	5
Botulism (Calif. 4)	75	Paralytic (NYC 1)	5
Cholera	-	Psittacosis (Calif. 1)	104
Congenital rubella syndrome	6	Rabies, human	-
Diphtheria	2	Tetanus (Calif. 1)	69
Leptospirosis	61	Trichinosis	78
Plague	18	Typhus fever, flea-borne (endemic, murine)	38

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plugs may not be inserted fully and are often not held in place to prevent slippage as they expand.

Noise-induced hearing loss is one of the most serious and common occupational diseases. More than three million workers wear hearing protectors in industrial environments where adequate engineering controls are unavailable to reduce noise to acceptable limits. The large differences between the laboratory-derived attenuation values provided by distributors and actual attenuation in industrial settings should be considered by employers when choosing earplugs for their employees. Workers can be endangered from excessive noise exposure if employers assume that workers will be protected to the extent indicated by laboratory tests.

References

1. NIOSH. A field investigation of noise reduction afforded by insert-type hearing protectors. (Pub #79-115): National Institute for Occupational Safety and Health, CDC, 1978.
2. NIOSH. A second field investigation of noise reduction afforded by insert-type hearing protectors, final report (#210-81-3001, unpublished). National Institute for Occupational Safety and Health, CDC, 1982.

TABLE 1. Median A-weighted noise reduction

Earplug type	Number of plants	Field tests (dB)*	Laboratory tests† (dB)
Twin-flanged	1	3	30
Single-flanged	3	8	29
Acoustic wool, type A	2	9	22
Acoustic wool, type B	1	11	30
Custom-molded, type A	2	12	20
Custom-molded, type B	2	15	19
Acoustic foam, type A	2	21	36
Acoustic foam, type B	2	17	36

*decibels

†Estimated from data provided by the distributor.

Current Trends

Human *Salmonella* Isolates — United States, 1981

In 1981, 35,625 salmonellae isolations (including *Salmonella typhi*) from humans were reported to CDC. This represents an increase of 18.7% over the 30,004 isolates reported in 1980. The ten most frequently isolated serotypes comprised 68.7% of the total isolates (Table 1). Four of these accounted for 53% of the increase; *S. typhimurium** alone accounted for over 30% (10,443 to 12,176) of the increase; *S. enteritidis* for 11% (1,904 to 2,554); *S. newport* for 8% (1,651 to 2,134); and *S. muenchen* for 4% (374 to 644). Increases were also reported in some of the less frequently isolated serotypes. For example, *S. drypool* increased 476% (17 to 98 isolations) from 1980; *S. chester*, 231% (55 to 182); *S. hadar*, 194% (47 to 138); and *S. seftenberg*, 138% (87 to 207).

The increase in isolates was not confined to one state or region. California, Georgia, Illinois, Louisiana, Massachusetts, Michigan, New York, and Ohio, accounted for 71% of the 18.7% increase. For some serotypes, increases were attributed to outbreaks in one or more states.

*Includes *S. typhimurium* var. *copenhagen*

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Epidemiologic Notes and Reports

Staphylococcal Infections among River Guides — Tennessee, South Carolina, and North Carolina

On July 29, 1982, a private physician notified the Tennessee Department of Public Health (TDPH) of six cases of staphylococcal cellulitis among guides employed by a whitewater-rafting company at the Ocoee River in eastern Tennessee. Investigation revealed additional cases among employees at seven rafting operations in Tennessee, North Carolina, and South Carolina.

The first rafting company (Company A) employs approximately 150 persons, including 91 river guides, at sites on the Nantahala, French Broad, Ocoee, and Chattooga rivers. Twenty-three percent of guides are female; most guides are between 18 and 35 years of age. Seventy percent of guides have worked with the company for more than one season. All employees eat and sleep on-site in a communal-like setting, with mess halls, common bathing facilities, and simple wooden bunkhouses at each site, but do not normally share linens, towels, washcloths, clothing, or personal equipment. Employees are assigned randomly to different sites each week.

Twenty-three employees at the Ocoee site were examined. A case was defined as a person who reported lesions compatible with staphylococcal cellulitis, furunculosis, or abscess with onset between April 15 and August 1, 1982. Seven (33%) of 21 guides met this case definition; of these, four had received oral antibiotics, and one had been hospitalized. Employees reported that similar lesions had been common among guides for at least 3 years; many believed that assignment to the Chattooga River site in South Carolina was associated with increased risk of infection. Accordingly, the 20 employees at that site were examined; 12 (71%) of 17 guides met the case definition. At both the Ocoee and Chattooga sites, infections occurred exclusively on the lower extremities, predominantly the anterior lower legs and feet.

A case-control study was conducted of these 38 guides, using uninfected guides as controls. All employees at the Ocoee and Chattooga sites were interviewed, and nasal, palm, and wound cultures were obtained at the Ocoee site. Stepwise logistic regression analysis suggested that a positive culture result and increasing number of weeks worked this season were positively correlated with infection, while experience in prior seasons was protective. Four of six cases from the Ocoee site had had infected roommates, as compared with two of 14 controls.

Work records of these employees were analyzed by the number of weeks worked at each site, and total work weeks at each site were compared for cases and controls. The odds that a given work-week was contributed by a case rather than a control were 2.4 times higher at the Chatooga site than at the Ocoee (odds ratio 2.4, $p < 0.005$). Many employees had not worked at one or more sites; attack rates for those employees with no exposure to certain