Sensitization of Laundry-Products Workers to Proteolytic Bacterial Enzymes — New Jersey

The National Institute for Occupational Safety and Health (NIOSH) found in a recent investigation at a laundry-products manufacturing company in New Jersey that some workers exposed to the proteolytic bacterial enzyme Esperase® in the manufacture of an enzyme bleach had become immunologically sensitized to the enzyme (*1*).

The environmental and medical evaluation, which was conducted in April and May 1980, was requested by the local union at the plant after skin rashes, conjunctivitis, and acute shortness of breath were noted in workers who entered the work area containing enzyme dust. In that work area Esperase® has been added to the dry bleach formulation since August 1978. Industrial hygiene monitoring indicated that air concentrations of enzyme dust ranged from 0.002 to 1.57$\mu g/M^3$; all of these levels were below the current occupational criterion of 3.9 $\mu g/M^3$ (*2*). Measurement of aerodynamic particle-size distributions indicated that approximately one-half of the total airborne dust was of respirable size (mass median diameter 4.4 μM).

The medical evaluation involved 24 employees: all 13 workers who had been regularly exposed to the enzyme dust, 2 workers who previously worked with the enzyme but had changed jobs, and a control group of 9 nonexposed workers. A standard questionnaire on respiratory problems was completed for these workers, and all had physical examinations, pulmonary-function tests, and radioallergosorbent tests (RASTs) for evaluation of IgE-mediated immunological sensitization to Esperase®. The prevalence of upper and/or lower respiratory tract symptoms, skin rashes, or post-workshift wheezes did not differ significantly for the exposed and nonexposed groups. However, 3 of the exposed workers had positive RASTs for antibody against the enzyme. All 3 were symptomatic or were noted to develop wheezes after a workshift. None of the nonexposed workers had a positive RAST. The 13 exposed employees also showed a significant mean decrease in lung function (FEV_1) of 0.114 liters between the beginning and end of the workshift ($p<0.05$); not all 13 reported symptoms. The nonexposed workers, however, did not have post-workshift pulmonary-function testing.

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Editorial Note: Enzyme-containing laundry products first came into commercial use in Europe in 1963. It soon became apparent that occupational exposures to detergent dusts containing enzyme material could cause a primary irritant dermatitis (*3*) and respiratory tract disease (*4*). Further medical studies demonstrating specific IgE antibodies (*5*), positive transfer tests (*6*), and positive respiratory tract challenges (*6*) to the enzyme indicated that allergic sensitization to some component of the enzyme material was the cause of the respiratory problems in enzyme-detergent workers. Since that time, some major producers of enzyme bases have reduced the "dustiness" of their products by reducing the content of small particles through agglomeration or encapsulation techniques. However, the NIOSH study demonstrates that despite the use of these techniques and despite apparently good control of occupational exposures to the enzyme dust, allergic sensitization of workers can still occur.* This allergic sensitization may be due

*It should be noted, however, that the air-sampling technique used could not evaluate the movement of workers from 1 area to another or assess intermittent high exposures resulting from spills or from failure of process equipment; thus, the data obtained may underestimate actual exposures.

Bacterial Enzymes – Continued

to a possibly greater antigenicity of Esperase® compared with that of other enzymes, or to initially high exposures of workers when the product was first introduced. Since this evaluation, the company has made plans to further reduce exposure to dust in the work area and has instituted an improved medical surveillance program.

References

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4. Gilson JC, Juniper CP, Martin RB, et al. Biological effects of proteolytic enzyme detergents. Thorax 1976; 31:621-34.
5. Pepys J, Hargreave FE, Longbottom JL, et al. Allergic reactions of the lungs to enzymes of *Bacillus subtilis*. Lancet 1969;1:1181-4.
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TABLE I. Summary – cases of specified notifiable diseases, United States

[Cumulative totals include revised and delayed reports through previous weeks.]

DISEASE	11th WEEK ENDING		MEDIAN 1976-1980	CUMULATIVE, FIRST 11 WEEKS		
	March 21 1981	March 15 1980		March 21 1981	March 15 1980	MEDIAN 1976-1980
Aseptic meningitis	67	76	44	674	717	419
Brucellosis	1	1	2	14	34	34
Chickenpox	7,438	6,305	6,395	60,485	55,868	61,439
Diphtheria	–	–	2	3	1	21
Encephalitis: Primary (arthropod-borne & unspec.)	23	10	10	155	125	125
Post-infectious	2	8	5	14	33	33
Hepatitis, Viral: Type B	408	377	328	3,805	3,301	3,180
Type A	468	596	629	5,140	5,894	6,262
Type unspecified	242	196	162	2,369	2,202	1,928
Malaria	20	21	12	260	279	83
Measles (rubeola)	73	356	813	550	2,098	4,904
Meningococcal infections: Total	100	85	75	1,087	705	578
Civilian	100	85	72	1,085	699	574
Military	–	–	–	2	6	4
Mumps	146	224	487	1,168	3,084	4,564
Pertussis	22	21	16	208	221	239
Rubella (German measles)	64	177	609	529	972	2,598
Tetanus	–	1	1	8	8	8
Tuberculosis	557	503	584	5,137	5,023	5,435
Tularemia	–	5	1	18	18	18
Typhoid fever	11	12	10	89	59	74
Typhus fever, tick-borne (Rky. Mt. spotted)	1	1	1	13	9	10
Venereal diseases:						
Gonorrhea: Civilian	17,979	18,460	17,976	201,072	202,487	201,005
Military	454	596	546	5,894	5,955	5,935
Syphilis, primary & secondary: Civilian	622	493	466	6,337	5,563	5,139
Military	–	7	4	77	84	64
Rabies in animals	169	104	70	1,169	986	508

TABLE II. Notifiable diseases of low frequency, United States

	CUM. 1981		CUM. 1981
Anthrax	–	Poliomyelitis: Total	–
Botulism Hawaii 1	11	Paralytic	–
Cholera	–	Psittacosis	15
Congenital rubella syndrome	2	Rabies in man	–
Leprosy N.Y. City 2, Calif. 1	44	Trichinosis	52
Leptospirosis	11	Typhus fever, flea-borne (endemic, murine)	–
Plague	1		

All delayed reports and corrections will be included in the following week's cumulative totals.

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MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Measles in Medical Settings — United States

In 1980, CDC received reports from 16 states of 32 episodes in which measles had probably been transmitted in medical settings. Of these, 20 involved only medical staff, 11 involved only patients, and 1 involved both patients and staff. A total of 57 cases were reported—31 in medical staff and 26 in patients and visitors. The 57 cases represent only 0.4% of the provisional total of 13,430 cases of measles reported during 1980.

Measles transmission apparently occurred in hospital emergency rooms in 5 episodes, in physicians' offices in 6 episodes, and in hospitals in 21 episodes. In only 7 of the 32 episodes could an individual with measles definitely be identified as the probable source of transmission in the medical-care setting. Although the number of cases per episode ranged from 1 to 6, 19 (59%) episodes involved only 1 case. Transmission from medical staff to a patient was documented only once, when a 24-year-old emergency room nurse apparently transmitted infection to 3 pediatric patients, 2 who were 1 year old and 1 who was 9 years old.

Employees who had measles ranged from 19 to 40 years old (Table 1); more than 50% were <30 years old. In contrast, patients and visitors who had measles ranged in age from 3 months to 26 years. More than 75% of this latter group were preschool children. Of the 31 medical staff members who were ill, the largest group was of nurses, followed by clerical staff in hospitals and physicians' offices (Table 2). Only 1 physician became ill.

TABLE 1. Age distribution of measles cases acquired in medical settings, United States, 1980

	Employees		Patients and visitors	
Age (Year)	Number	Percentage	Number	Percentage
<1	0	—	5	19.2
1-4	0	—	15	57.7
5-9	0	—	1	3.9
10-14	0	—	0	0.0
15-19	1	3.7	2	7.7
20-24	8	29.6	1	3.9
25-29	7	25.9	2	7.7
30-34	4	14.8	0	0.0
35-39	6	22.2	0	0.0
40-44	1	3.7	0	0.0
Subtotal	27	99.9	26	100.1
Unknown	4		0	
Total	31		26	