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Epidemiologic Notes and Reports

Acute Schistosomiasis with Transverse Myelitis in American Students Returning from Kenya

In early May 1984, CDC received reports that 15 (83%) of 18 American students participating in a travel/study program in Kenya had acquired *Schistosoma mansoni* infections. Two of these students developed flaccid paraplegia. Although data are incomplete on all 18 students, no unusual attributes could be identified in these two students that might explain why their infections were associated with severe neurologic disease. General background information and the case histories of these students follow.

All 18 students arrived in Kenya on February 13, 1984. From March 5 to March 25, they shared housing in the Machakos district. To provide a place for bathing, the students dammed a small stream; two of the infected students recalled experiencing an itchy rash shortly after bathing at this site. Subsequently, the group separated, as the students took individual assignments in various regions of the country. Between April 26 and May 12, 14 of the 15 infected individuals became acutely ill with fever, diarrhea, malaise, and weight loss.

Student 1: This 21-year-old white male was in good health and had never traveled outside the United States. He was immunized against tetanus, typhoid, cholera, and yellow fever, and received an injection of immune globulin before arriving in Kenya. While in Kenya, he took weekly chloroquine and Fansidar® for malaria prophylaxis. In early April, he complained of fever, abdominal pain, and diarrhea without blood or mucus, all of which resolved without therapy. He became ill again on April 26, with fever, chills, sweats, anorexia, mild nonbloody diarrhea, and abdominal pain. There was no hematuria or cough. He was treated orally with chloroquine for a presumptive diagnosis of malaria. On April 28, he developed severe lumbar back pain without tenderness or radiation and had associated numbness, without weakness, in both feet. On May 1, he had difficulty recognizing the position of his feet and had extreme proximal lower extremity weakness. On May 2, he became ataxic and developed urinary retention. A diagnosis of transverse myelitis secondary to schistosomiasis was made when stool examinations showed ova of *S. mansoni*. The patient was treated with praziquantel and prednisone. He was transported to the United States on May 5.

On evaluation in the United States, the student had no rash, fever, lymphadenopathy, hepatosplenomegaly, or point tenderness on palpation of the spinal column. Neurologic examination revealed a flaccid paraplegia at and below the level of T-10. There was marked sensory loss, including loss of vibratory sensation. Superficial and deep tendon reflexes could not be elicited.

A white blood cell count revealed moderate eosinophilia. A myelogram showed no obstruction or mass, but a CAT scan showed the lumbar cord to be slightly enlarged, without focal abnormalities. Examination of cerebrospinal fluid (CSF) showed pleocytosis and elevated protein; however, eosinophilic pleocytosis was not present. Fecal examination showed 500

Acute Schistosomiasis — Continued

S. mansoni eggs per gram of stool; no other helminthic or protozoal pathogens were observed. Serologic tests for antibody to mycoplasma, Epstein Barr virus (EBV), and other viral agents were negative.

On May 15, the patient was transferred to a spinal cord rehabilitation center. His neurologic condition remains unchanged.

Student 2: A 20-year-old white female was in good health and had not previously traveled overseas. She received similar immunizations as Student 1 and took chloroquine and Fansidar® weekly for malaria prophylaxis. On April 29, she developed fever, abdominal pain, and nonbloody diarrhea. A Gram stain of her urine showed gram-positive cocci, and she was treated with ampicillin. She also received metronidazole, although it was unclear whether amoebae were found by stool examination. On May 3, she developed severe back pain without radiation, weakness, or urinary symptoms. From May 7 to May 9, she rapidly lost the ability to ambulate. She complained of difficulty initiating her urine stream. On May 9, after a stool examination showed many ova of *S. mansoni*, she was diagnosed as having schistosomal transverse myelitis and treated with oxamniquine. She was transported to the United States on May 11.

Evaluation in the United States was unremarkable except for a flaccid paralysis and severely decreased sensation to temperature and touch in the lower extremities. Deep tendon reflexes could not be elicited. The level of the lesion was placed at L1-L2.

There was moderate eosinophilia. CSF examination showed pleocytosis and elevated protein; however, eosinophilic pleocytosis was not present. A myelogram showed no obstruction, but a CAT scan of the spine suggested some swelling of the conus medullaris. Stool examination showed only *S. mansoni* (1,100 eggs per gram of feces). Serologic tests for antibody to mycoplasma, EBV, and other viral agents were negative.

Because the dose of oxamniquine given in Kenya was considered inadequate, the patient was treated with praziquantel. Large doses of dexamethasone were also given. The patient's motor function and sensation improved by the second treatment day. On May 15, she began moving both extremities against gravity. On June 8, the patient was ambulating with assistance at a spinal rehabilitation center.

Reported by J Houpis, MD, Brattleboro, Vermont; J Oexmann, MD, J Martin, MD, G Jacobi, MD, Depts of Neurology and Infectious Diseases, Massachusetts General Hospital, Boston; J Reardon, MD, Assistant Director, Div of Communicable and Venereal Diseases, G Waterman, MD, Acting State Epidemiologist, Massachusetts Dept of Health; Helminthic Diseases Br, Div of Parasitic Diseases, Center for Infectious Diseases, CDC.

Editorial Note: Although *S. mansoni* and *S. haematobium* are endemic to the Machakos district of Kenya (*1*), no infections with *S. haematobium* occurred among any of the 18 students. Schistosomiasis of the central nervous system (CNS) was first recognized in the late 19th century and has been most commonly reported as a cerebral granulomatous disease resulting from ectopically located *S. japonicum* eggs (*2*). Schistosomal transverse myelitis is rare and has been observed most frequently in infections with *S. mansoni* (*3*). Since *S. mansoni* transverse myelitis (SMTM) was first reported in 1930, about 32 tissue-proven cases and over 28 presumed cases have been reported. When autopsy or surgical biopsy is not performed, a presumptive diagnosis of SMTM is based on the following considerations: (1) the finding of low thoracic/upper lumbar neurological symptoms; (2) demonstration of exposure to schistosomes through parasitologic or serologic techniques; and (3) the exclusion of other known causes of transverse myelitis (*5,6*). In contrast to schistosomal transverse myelitis, other causes of transverse myelitis commonly affect the mid-thoracic cord (*4*). Eosinophilic pleocytosis in the CSF is suggestive of schistosomiasis of the CNS but is often not observed, as in the cases reported here.

Acute Schistosomiasis — Continued

Other disorders that have been associated with transverse myelitis include numerous viral, bacterial, and fungal infections (especially with enterovirus, EBV, tuberculosis, syphilis, and coccidioidomycosis), postvaccinal reactions, collagen vascular diseases, toxin exposures, and vascular disease. Conditions that can mimic transverse myelitis include tumor, Guillan-Barré syndrome, and multiple sclerosis (*4*). All of these, including SMTM, are rare, and the observed attack rate of 13% (2/15) in this group of students is unusual, regardless of etiology.

Schistosomal myelopathy results from the inflammatory reaction accompanying the deposition of eggs in the venules located in and around the spinal cord (*2,3*). How eggs, which are normally oviposited in the venules of the inferior mesenteric vein of the portal system, reach the spinal vascular system is unknown. Several hypotheses have been proposed (*2,3,6*).

Praziquantel or oxamniquine are the antischistosomal agents available to treat SMTM. Treatment destroys the adult worms and thereby prevents further oviposition. Praziquantel is effective against all schistosomes; however, oxamniquine is only effective against *S. mansoni*. The dosage of oxamniquine needed varies according to the geographic location where the infection was acquired (*7*). Steroids are used to suppress the host response around the ectopic eggs (*5,6*). Myelography may identify discrete granulomatous masses that may be amenable to surgical removal (*8*). In 50% of reported cases, there is little or no return of neurologic function (*2,3,5,6*), and intensive rehabilitative care is indicated. When evaluating persons for infection with schistosomes, interpretation of negative tests may be difficult, since extremely mild infections or ectopic localization of worms may preclude detection of eggs with stool or urine examinations. Because of the potential benefit of the recommended therapy, presumptive treatment of patients with diagnoses of transverse myelitis and histories of water exposure in endemic areas should be initiated while awaiting results of parasitologic or serologic tests.

The severity of illness in this group should reemphasize the need for travelers visiting areas endemic for schistosomiasis to be aware of precautions that may decrease the risk of infection. Since there is no practicable way to distinguish infested from noninfested water, it is prudent to avoid fresh-water swimming. Heating bathing water to 50 C (122 F) for 5 minutes or treating it with iodine or chlorine in a manner similar to the precautions recommended for preparing drinking water will destroy cercaria. Filtering water with a tightly woven cloth or with paper coffee filters may also be effective in removing cercaria from bathing water. If these measures are not feasible, allowing bathing water to stand for 3 days is advisable, since cercaria survive only 48 hours. If accidental exposure to suspected water occurs, immediate and vigorous towel drying or rapid application of rubbing alcohol to the exposed areas may reduce the risk of infection. The effectiveness of available antischistosomal drugs as chemoprophylactic agents has not been evaluated (*9*).

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Work-Related Allergies in Insect-Raising Facilities

Complaints of skin and respiratory allergies have frequently been reported by employees in facilities that raise insects for entomologic research. In 1980, the U.S. Department of Agriculture asked the National Institute for Occupational Safety and Health (NIOSH) to conduct a health hazard evaluation among employees of the Agricultural Research Service (ARS). For this study, NIOSH used a mailed, self-administered questionnaire. This questionnaire was designed to assess the prevalence of symptoms possibly related to allergenic airborne particulates associated with raising colonies of insects in confined spaces; the frequency of insect bites or stings was not of major concern in the study.

The following case reports are representative of those elicited by the survey.

Case 1: A worker had onset of burning eyes and nasal and sinus "stuffiness" after working for about 2 years with various moth species. These symptoms typically began approximately an hour after exposure to the moths and would last up to 1 day after exposure ceased. Use of

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

Disease	31st Week Ending			Cumulative, 31st Week Ending		
	Aug. 4, 1984	Aug. 6 1983	Median 1979-1983	Aug. 4, 1984	Aug. 6 1983	Median 1979-1983
Acquired Immunodeficiency Syndrome (AIDS)	84	N	N	2,397	N	N
Aseptic meningitis	283	434	290	3,017	4,110	3,507
Encephalitis: Primary (arthropod-borne & unspec.)	25	67	43	529	710	608
Post-infectious	2	2	2	65	60	60
Gonorrhea: Civilian	16,069	17,992	20,615	479,330	524,170	571,771
Military	657	502	574	12,548	14,093	16,103
Hepatitis: Type A	380	369	548	12,232	12,346	15,134
Type B	602	484	442	14,691	13,908	12,013
Non A, Non B	70	72	N	2,175	2,039	N
Unspecified	122	137	202	3,470	4,257	5,946
Legionellosis	12	23	N	337	420	N
Leprosy	5	6	5	131	152	126
Malaria	20	14	16	496	443	609
Measles: Total*	46	15	33	2,117	1,174	2,438
Indigenous	43	12	N	1,881	979	N
Imported	3	3	N	236	195	N
Meningococcal infections: Total	49	39	39	1,852	1,875	1,875
Civilian	49	39	39	1,848	1,859	1,859
Military	-	-	-	4	16	13
Mumps	20	33	49	2,045	2,299	4,084
Pertussis	44	67	51	1,138	1,265	785
Rubella (German measles)	6	10	33	491	726	1,862
Syphilis (Primary & Secondary): Civilian	498	721	596	16,406	19,060	17,749
Military	5	6	5	207	248	230
Toxic Shock syndrome	9	4	N	253	277	N
Tuberculosis	415	442	492	12,581	13,652	15,737
Tularemia	14	11	9	164	165	131
Typhoid fever	4	11	12	177	220	258
Typhus fever, tick-borne (RMSF)	35	57	49	468	699	691
Rabies, animal	94	107	111	2,967	3,825	3,825

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1984		Cum. 1984
Anthrax	1	Plague	16
Botulism: Foodborne (Wash. 1)	7	Poliomyelitis: Total	2
Infant (Calif. 2)	59	Paralytic	2
Other	4	Psittacosis (Oreg. 1, Calif. 1)	49
Brucellosis (Upstate N.Y. 1, Mo. 1)	62	Rabies, human	-
Cholera	-	Tetanus (Upstate N.Y. 1, Ga. 1)	33
Congenital rubella syndrome	3	Trichinosis	56
Diphtheria	1	Typhus fever, flea-borne (endemic, murine) (N.C. 1, Tex. 1)	12
Leptospirosis	10		

*Two of the 46 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending August 4, 1984 and August 6, 1983 (31st Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1984	1984	Cum. 1984	Cum. 1984	Cum. 1984	Cum. 1983	1984	1984	1984	1984	1984	Cum. 1984
UNITED STATES	2,397	283	529	65	479,330	524,170	380	602	70	122	12	131
NEW ENGLAND	73	7	32	1	13,679	13,167	8	31	-	13	3	6
Maine	1	1	-	-	556	678	1	3	-	-	-	-
N.H.	1	3	4	-	390	410	-	4	-	-	-	-
Vt.	-	-	3	-	223	246	-	2	-	-	-	-
Mass.	38	-	17	-	5,520	5,626	7	15	-	13	2	4
R.I.	4	3	-	-	949	737	-	3	-	-	-	2
Conn.	29	-	8	1	6,041	5,470	-	4	-	-	1	-
MID ATLANTIC	1,073	69	64	7	65,524	67,049	45	154	12	17	-	25
Upstate N.Y.	97	28	25	5	9,969	10,484	8	35	5	3	-	2
N.Y. City	776	9	4	-	27,191	27,030	23	67	-	6	-	23
N.J.	151	18	16	-	10,954	12,759	9	31	4	7	-	-
Pa.	49	14	19	2	17,410	16,776	5	21	3	1	-	-
E.N. CENTRAL	109	46	122	16	66,502	74,667	20	57	2	10	6	6
Ohio	15	27	39	8	16,980	19,192	7	23	1	5	4	2
Ind.	16	6	22	-	7,886	7,470	1	8	-	1	2	-
Ill.	54	-	16	6	15,038	21,301	-	9	-	-	-	2
Mich.	15	13	29	-	19,139	20,143	12	17	1	4	-	2
Wis.	9	-	16	2	7,459	6,561	-	-	-	-	-	-
W.N. CENTRAL	22	8	32	1	23,163	24,500	11	11	3	2	1	1
Minn.	5	1	11	-	3,457	3,451	2	1	1	1	-	-
Iowa	1	-	14	-	2,530	2,651	2	2	-	-	1	1
Mo.	11	3	3	-	11,216	12,031	4	5	1	1	-	-
N. Dak.	-	-	-	-	228	253	-	-	-	-	-	-
S. Dak.	-	-	-	1	568	669	-	-	-	-	-	-
Nebr.	2	-	1	-	1,577	1,505	-	-	-	-	-	-
Kans.	3	4	3	-	3,587	3,940	3	3	1	-	-	-
S. ATLANTIC	353	57	89	14	121,537	135,035	16	117	8	9	-	6
Del.	4	-	1	-	2,149	2,425	1	1	-	-	-	-
Md.	23	14	22	-	14,010	17,312	1	18	2	4	-	-
D.C.	49	-	-	-	8,793	9,187	-	2	-	-	-	1
Va.	18	14	22	5	11,465	11,745	4	15	2	2	-	4
W. Va.	4	1	5	-	1,479	1,402	1	2	-	-	-	-
N.C.	7	2	18	7	19,435	20,001	-	12	-	-	-	-
S.C.	6	4	3	-	12,074	12,854	-	14	-	-	-	-
Ga.	31	7	2	1	22,984	27,504	3	20	1	1	-	-
Fla.	211	15	16	1	29,148	32,605	6	33	3	2	-	1
E.S. CENTRAL	15	16	28	7	41,890	44,193	6	23	1	1	1	-
Ky.	7	-	5	-	4,998	5,064	1	2	-	-	-	-
Tenn.	4	6	8	1	17,309	18,286	1	11	-	-	-	-
Ala.	3	10	13	6	13,412	13,713	4	7	1	1	1	-
Miss.	1	-	2	-	6,171	7,130	-	3	-	-	-	-
W.S. CENTRAL	150	24	37	4	65,418	74,296	44	41	4	34	-	9
Ark.	1	-	-	2	5,646	5,682	-	2	-	8	-	-
La.	18	10	4	-	14,906	13,663	9	3	2	-	-	-
Okla.	4	1	13	1	7,049	8,723	1	7	-	1	-	-
Tex.	127	13	20	1	37,817	46,228	34	29	2	25	-	9
MOUNTAIN	35	19	20	7	15,386	16,428	71	39	3	6	-	7
Mont.	-	-	-	-	652	715	-	1	-	-	-	-
Idaho	-	-	-	-	781	719	-	2	-	-	-	-
Wyo.	1	1	-	-	445	438	-	-	-	-	-	-
Colo.	19	12	7	-	4,411	4,639	13	14	-	3	-	-
N. Mex.	-	-	-	-	1,738	2,031	8	5	-	-	-	-
Ariz.	8	3	7	3	4,184	4,594	17	10	2	1	-	5
Utah	3	3	6	4	748	802	24	1	1	2	-	1
Nev.	4	-	-	-	2,427	2,490	9	6	-	-	-	1
PACIFIC	567	37	105	8	66,231	74,835	159	129	37	30	1	71
Wash.	28	6	4	-	4,641	5,841	6	10	5	1	-	3
Oreg.	3	-	-	-	3,973	4,016	29	7	8	-	-	1
Calif.	527	30	99	8	54,838	61,580	124	112	24	29	1	52
Alaska	-	-	-	-	1,654	1,857	-	-	-	-	-	-
Hawaii	9	1	2	-	1,125	1,541	-	-	-	-	-	15
Guam	-	U	-	-	95	98	U	U	U	U	U	-
P.R.	33	5	-	1	1,944	1,663	4	17	-	7	-	2
V.I.	-	U	-	-	256	169	U	U	U	U	U	-
Pac. Trust Terr.	-	U	-	-	-	-	U	U	U	U	U	-

N: Not notifiable U: Unavailable

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending August 4, 1984 and August 6, 1983 (31st Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported *		Total									
	Cum. 1984	1984	Cum. 1984	1984	Cum. 1984	Cum. 1983	Cum. 1984	1984	Cum. 1984	1984	Cum. 1984	Cum. 1983	1984	Cum. 1984	Cum. 1983
UNITED STATES	496	43	1,881	3	236	1,174	1,852	20	2,045	44	1,138	1,265	6	491	726
NEW ENGLAND	32	-	98	1	11	15	109	1	68	2	28	41	-	29	13
Maine	-	-	-	-	-	-	1	-	18	-	1	4	-	1	-
N.H.	-	-	34	-	3	3	6	-	15	-	6	6	-	1	4
Vt.	3	-	2	1§	5	-	26	-	5	2	16	7	-	-	4
Mass.	16	-	52	-	-	4	36	1	15	-	3	20	-	27	5
R.I.	4	-	-	-	-	-	11	-	6	-	1	4	-	-	-
Conn.	9	-	10	-	3	8	29	-	9	-	1	-	-	-	-
MID ATLANTIC	80	4	107	1	29	85	321	6	241	4	104	259	4	168	125
Upstate N.Y.	21	-	21	-	10	7	111	5	60	3	60	83	3	101	22
N.Y. City	16	4	82	1†	13	48	68	1	16	1	4	41	1	52	86
N.J.	24	-	4	-	2	27	63	-	127	-	6	15	-	11	3
Pa.	19	-	-	-	4	3	79	-	38	-	34	120	-	4	14
E.N. CENTRAL	41	5	576	-	67	633	296	3	837	18	310	310	-	72	111
Ohio	9	-	3	-	5	85	103	1	423	4	56	84	-	2	2
Ind.	1	-	2	-	1	400	37	-	42	13	208	31	-	2	23
Ill.	14	-	160	-	1	140	59	1	159	-	16	123	-	42	45
Mich.	7	5	401	-	54	7	59	1	155	1	18	17	-	18	15
Wis.	10	-	10	-	6	1	38	-	58	-	12	55	-	8	26
W.N. CENTRAL	18	1	3	-	3	1	118	-	81	4	88	76	-	28	30
Minn.	6	-	-	-	3	1	22	-	4	3	12	30	-	2	6
Iowa	1	-	-	-	-	-	20	-	17	1	6	5	-	1	-
Mo.	7	1	3	-	-	-	36	-	7	-	13	15	-	-	-
N. Dak.	1	-	-	-	-	-	1	-	1	-	-	1	-	3	-
S. Dak.	-	-	-	-	-	-	6	-	-	-	6	3	-	-	-
Nebr.	1	-	-	-	-	-	9	-	3	-	2	-	-	-	-
Kans.	2	-	-	-	-	-	24	-	49	-	49	22	-	22	24
S. ATLANTIC	84	2	14	1	23	181	384	1	145	1	86	173	-	21	87
Del.	4	-	-	-	-	-	3	-	2	-	2	2	-	-	-
Md.	21	-	6	1†	11	6	30	-	27	-	4	25	-	1	1
D.C.	1	-	-	-	5	-	5	-	-	-	-	-	-	-	-
Va.	20	-	1	-	1	23	46	-	15	-	12	45	-	-	1
W. Va.	1	-	-	-	-	-	5	-	28	-	8	5	-	-	-
N.C.	6	-	-	-	-	1	55	1	19	-	17	18	-	-	10
S.C.	1	-	-	-	-	4	38	-	2	-	1	13	-	-	1
Ga.	6	-	-	-	-	8	78	-	17	-	6	43	-	2	11
Fla.	24	2	7	-	6	139	124	-	35	1	36	22	-	18	63
E.S. CENTRAL	6	-	1	-	2	6	100	1	40	2	8	16	-	9	10
Ky.	-	-	1	-	-	1	39	-	8	-	1	5	-	3	9
Tenn.	2	-	-	-	2	-	24	-	12	2	4	4	-	-	-
Ala.	4	-	-	-	-	5	25	1	6	-	-	3	-	3	1
Miss.	-	-	-	-	-	-	12	-	14	-	3	4	-	3	-
W.S. CENTRAL	39	21	481	-	23	73	196	-	108	2	235	203	-	13	94
Ark.	-	-	-	-	-	12	27	-	5	-	12	15	-	3	-
La.	5	-	-	-	-	25	43	-	-	-	4	5	-	-	9
Okla.	6	-	-	-	8	1	23	N	N	2	208	152	-	-	-
Tex.	28	21	481	-	15	35	103	-	103	-	11	31	-	10	85
MOUNTAIN	17	-	91	-	34	3	64	-	197	2	81	129	-	14	27
Mont.	1	-	-	-	-	-	2	-	4	-	17	1	-	-	3
Idaho	2	-	-	-	23	-	6	-	9	-	3	4	-	1	8
Wyo.	-	-	-	-	-	-	2	-	1	-	3	5	-	2	2
Colo.	1	-	-	-	1	2	24	-	14	1	29	85	-	2	-
N. Mex.	1	-	68	-	8	-	7	N	N	-	5	9	-	-	-
Ariz.	9	-	-	-	-	1	15	-	163	1	16	14	-	-	6
Utah	3	-	23	-	2	-	5	-	5	-	6	11	-	6	7
Nev.	-	-	-	-	-	-	3	-	1	-	2	-	-	3	1
PACIFIC	179	10	510	-	44	177	264	8	328	9	198	58	2	137	229
Wash.	6	-	110	-	13	4	40	-	34	4	44	10	-	1	9
Oreg.	8	-	-	-	-	9	39	N	N	-	11	6	-	1	13
Calif.	162	5	265	-	27	161	177	8	273	5	74	41	2	131	206
Alaska	-	-	-	-	-	2	7	-	5	-	-	-	-	1	1
Hawaii	3	5	135	-	4	1	1	-	16	-	69	1	-	3	-
Guam	1	U	83	U	2	2	1	U	5	U	-	-	U	2	-
P.R.	4	-	-	-	-	81	3	4	102	-	-	8	-	6	3
V.I.	-	U	-	U	-	5	-	U	3	U	-	-	U	-	2
Pac. Trust Terr.	-	U	-	U	-	-	-	U	-	U	-	-	U	-	-

*For measles only, imported cases includes both out-of-state and international importations.

N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending August 4, 1984 and August 6, 1983 (31st Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1984	Cum. 1983	1984	Cum. 1984	Cum. 1983	Cum. 1984	Cum. 1984	Cum. 1984	Cum. 1984
UNITED STATES	16,406	19,060	9	12,581	13,652	164	177	468+	2,967
NEW ENGLAND	314	410	1	364	401	4	9	2	26
Maine	3	11	-	18	26	-	-	-	10
N.H.	10	16	1	23	28	-	-	-	6
Vt.	1	1	-	8	6	-	-	-	-
Mass.	185	257	-	196	205	4	7	2	5
R.I.	11	14	-	28	31	-	-	-	-
Conn.	104	111	-	91	105	-	2	-	5
MID ATLANTIC	2,231	2,404	-	2,275	2,431	-	26	8	204
Upstate N.Y.	157	199	-	393	371	-	10	3	28
N.Y. City	1,396	1,417	-	922	1,002	-	6	1	-
N.J.	399	464	-	497	524	-	6	3	5
Pa.	279	324	-	463	534	-	4	1	171
E.N. CENTRAL	752	1,040	6	1,697	1,767	2	23	27	127
Ohio	153	274	6	322	277	-	4	21	14
Ind.	85	74	-	186	181	-	2	4	13
Ill.	249	509	-	703	765	2	8	-	52
Mich.	218	138	-	380	455	-	3	2	14
Wis.	47	45	-	106	89	-	6	-	34
W.N. CENTRAL	236	227	-	375	445	59	6	28	507
Minn.	69	92	-	67	87	-	2	-	52
Iowa	10	11	-	42	44	-	-	1	100
Mo.	117	84	-	183	226	31	3	5	40
N. Dak.	6	2	-	9	5	-	-	-	105
S. Dak.	2	9	-	13	30	26	-	4	133
Nebr.	11	11	-	18	16	-	-	2	34
Kans.	21	18	-	43	37	2	1	16	43
S. ATLANTIC	4,887	4,996	-	2,617	2,726	4	22	235	825
Del.	31	20	-	32	24	-	-	-	4
Md.	302	326	-	275	219	-	1	26	438
D.C.	191	219	-	97	110	-	6	-	-
Va.	246	339	-	255	277	-	5	34	140
W. Va.	11	18	-	82	86	-	-	6	28
N.C.	488	464	-	399	389	1	1	89	13
S.C.	446	311	-	318	249	-	1	55	30
Ga.	832	914	-	371	490	3	1	23	108
Fla.	2,340	2,385	-	788	882	-	7	2	64
E.S. CENTRAL	1,111	1,303	-	1,153	1,251	3	5	43	148
Ky.	63	85	-	277	303	-	2	7	43
Tenn.	302	373	-	355	375	3	2	23	60
Ala.	354	523	-	343	325	-	1	7	45
Miss.	392	322	-	178	248	-	-	6	-
W.S. CENTRAL	4,043	5,026	1	1,442	1,632	71	10	113	627
Ark.	109	123	1	153	188	49	-	18	64
La.	719	1,036	-	182	271	6	1	1	34
Okla.	134	130	-	151	126	15	2	74	73
Tex.	3,081	3,737	-	956	1,047	1	7	20	456
MOUNTAIN	367	404	1	322	384	15	10	10	154
Mont.	2	5	-	14	34	-	1	8	80
Idaho	14	6	-	20	21	4	-	1	2
Wyo.	4	9	-	-	10	-	-	1	4
Colo.	86	91	-	30	50	5	2	-	25
N. Mex.	50	121	-	61	77	1	3	-	9
Ariz.	137	96	1	152	143	2	3	-	26
Utah	12	13	-	29	28	2	-	-	1
Nev.	62	63	-	16	21	1	1	-	7
PACIFIC	2,465	3,250	-	2,336	2,615	6	66	2	349
Wash.	83	116	-	119	133	-	2	-	1
Oreg.	71	74	-	96	113	2	1	1	1
Calif.	2,261	3,013	-	1,961	2,187	4	58	-	341
Alaska	3	7	-	33	36	-	1	1	6
Hawaii	47	40	-	127	146	-	4	-	-
Guam	-	-	U	5	4	-	-	-	-
P.R.	482	598	-	244	290	-	3	-	34
V.I.	8	12	U	2	1	-	3	-	-
Pac. Trust Terr.	-	-	U	-	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending August 4, 1984 (31st Week Ending)

Reporting Area	All Causes, By Age (Years)						P&I** Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	600	440	103	31	16	10	41
Boston, Mass.	171	104	40	11	8	8	14
Bridgeport, Conn.	36	28	6	-	2	-	-
Cambridge, Mass.§	25	25	-	-	-	-	2
Fall River, Mass.	17	16	-	-	1	-	-
Hartford, Conn.	58	44	8	4	2	-	2
Lowell, Mass.	24	18	5	1	-	-	1
Lynn, Mass.	19	15	4	-	-	-	2
New Bedford, Mass.	23	19	3	1	-	-	-
New Haven, Conn.	41	29	8	4	-	-	3
Providence, R.I.	50	38	6	2	3	1	4
Somerville, Mass.	7	4	3	-	-	-	1
Springfield, Mass.	43	35	7	1	-	-	3
Waterbury, Conn.	37	26	6	5	-	-	4
Worcester, Mass.	49	39	7	2	-	1	5
MID. ATLANTIC	2,460	1,576	554	187	64	78	111
Albany, N.Y.	52	34	10	4	2	2	-
Allentown, Pa.	17	13	4	-	-	-	-
Buffalo, N.Y.	98	64	21	7	2	4	-
Camden, N.J.	39	23	13	2	1	-	2
Elizabeth, N.J.	22	17	3	1	1	-	5
Erie, Pa.†	44	26	12	3	1	2	1
Jersey City, N.J.	51	31	12	6	1	1	-
N.Y. City, N.Y.	1,256	823	269	106	31	27	62
Newark, N.J.	63	26	23	7	2	4	3
Paterson, N.J.	15	8	4	-	1	2	-
Philadelphia, Pa.†	388	213	103	29	16	27	15
Pittsburgh, Pa.†	55	34	14	5	1	1	2
Reading, Pa.	32	25	4	1	1	1	-
Rochester, N.Y.	120	89	20	5	1	5	13
Schenectady, N.Y.	23	19	3	1	-	-	1
Scranton, Pa.†	22	19	2	1	-	-	-
Syracuse, N.Y.	75	47	18	6	2	2	1
Trenton, N.J.	33	19	11	2	1	-	-
Utica, N.Y.	22	17	4	1	-	-	-
Yonkers, N.Y.	33	29	4	-	-	-	6
E.N. CENTRAL	2,071	1,434	376	126	69	56	75
Akron, Ohio	63	39	14	6	3	1	-
Canton, Ohio	37	23	10	2	1	1	-
Chicago, Ill§	436	392	4	7	13	11	9
Cincinnati, Ohio	133	82	34	11	3	3	14
Cleveland, Ohio	160	87	39	16	6	12	3
Columbus, Ohio	125	78	27	10	4	6	2
Dayton, Ohio	93	56	22	6	7	2	2
Detroit, Mich.	234	135	63	19	11	5	4
Evansville, Ind.	50	34	13	2	-	1	2
Fort Wayne, Ind.	66	42	16	5	1	2	5
Gary, Ind.	20	10	4	3	2	1	-
Grand Rapids, Mich.	72	54	13	3	1	1	9
Indianapolis, Ind.	161	108	36	10	5	2	5
Madison, Wis.	38	27	6	3	1	1	6
Milwaukee, Wis.	107	75	20	6	3	3	3
Peoria, Ill.	38	26	7	3	2	-	3
Rockford, Ill.	37	27	5	3	1	1	2
South Bend, Ind.	38	26	9	1	1	1	1
Toledo, Ohio	109	69	25	9	4	2	5
Youngstown, Ohio	54	44	9	1	-	-	-
W.N. CENTRAL	696	470	141	38	20	27	24
Des Moines, Iowa	69	54	9	1	3	2	3
Duluth, Minn.	30	22	6	1	-	1	2
Kansas City, Kans.	24	13	5	3	-	3	-
Kansas City, Mo.	103	66	26	3	2	6	5
Lincoln, Nebr.	31	24	4	1	1	1	-
Minneapolis, Minn.	97	57	20	12	5	3	1
Omaha, Nebr.	76	48	20	2	1	5	6
St. Louis, Mo.	132	83	34	10	2	3	1
St. Paul, Minn.	54	46	4	2	1	1	-
Wichita, Kans.	80	57	13	3	5	2	6

Reporting Area	All Causes, By Age (Years)						P&I** Total
	All Ages	≥65	45-64	25-44	1-24	<1	
S. ATLANTIC	1,034	645	238	76	39	36	35
Atlanta, Ga.	156	93	40	14	5	4	2
Baltimore, Md.	160	97	35	13	10	5	2
Charlotte, N.C.	69	38	17	6	5	3	3
Jacksonville, Fla.	70	49	14	2	2	3	7
Miami, Fla.	119	66	27	11	8	7	2
Norfolk, Va.	40	18	13	6	1	2	4
Richmond, Va.	82	47	27	6	-	2	5
Savannah, Ga.	46	32	10	1	2	1	-
St. Petersburg, Fla.	91	84	4	2	-	1	4
Tampa, Fla.	67	40	14	7	3	3	3
Washington, D.C.	90	53	25	6	2	4	2
Wilmington, Del.	44	28	12	2	1	1	1
E.S. CENTRAL	735	450	174	53	25	33	41
Birmingham, Ala.	112	71	28	10	3	-	2
Chattanooga, Tenn.	56	35	16	3	-	2	4
Knoxville, Tenn.	54	33	17	2	2	-	4
Louisville, Ky.	106	65	28	6	2	5	6
Memphis, Tenn.	200	120	41	8	13	18	11
Mobile, Ala.	45	29	8	5	2	1	3
Montgomery, Ala.	44	27	10	3	-	4	2
Nashville, Tenn.	118	70	26	16	3	3	9
W.S. CENTRAL	1,198	712	286	103	50	46	21
Austin, Tex.	46	30	6	7	3	-	3
Baton Rouge, La.	73	41	25	2	1	4	2
Corpus Christi, Tex.	57	38	11	5	1	1	-
Dallas, Tex.	176	102	44	19	8	3	2
El Paso, Tex.	52	38	10	1	1	2	-
Fort Worth, Tex.	98	57	16	5	5	15	2
Houston, Tex.	291	160	77	31	12	11	1
Little Rock, Ark.	47	23	14	4	4	2	1
New Orleans, La.	98	56	24	7	6	5	1
San Antonio, Tex.	125	81	27	10	5	2	5
Shreveport, La.	61	36	18	5	2	-	1
Tulsa, Okla.	74	50	14	7	2	1	3
MOUNTAIN	569	345	137	41	21	25	30
Albuquerque, N.Mex.	60	32	20	5	2	1	8
Colo. Springs, Colo.	31	14	9	6	-	2	4
Denver, Colo.	110	64	26	6	4	10	3
Las Vegas, Nev.	78	37	25	11	3	2	3
Ogden, Utah	20	11	8	1	-	-	3
Phoenix, Ariz.	144	94	28	9	8	5	1
Pueblo, Colo.	9	8	-	-	1	-	-
Salt Lake City, Utah	33	25	4	-	2	2	1
Tucson, Ariz.	84	60	17	3	1	3	7
PACIFIC	1,952	1,303	359	139	82	56	100
Berkeley, Calif.	15	11	2	1	-	1	-
Fresno, Calif.	82	52	12	11	2	5	7
Glendale, Calif.	24	21	3	-	-	-	2
Honolulu, Hawaii	80	49	17	4	9	1	3
Long Beach, Calif.	80	41	28	6	3	2	1
Los Angeles, Calif.	643	409	124	63	30	10	29
Oakland, Calif.	75	44	15	4	6	6	2
Pasadena, Calif.	27	14	5	2	2	4	3
Portland, Oreg.	105	70	22	7	4	2	6
Sacramento, Calif.	111	75	21	10	2	2	6
San Diego, Calif.	134	85	29	7	7	6	12
San Francisco, Calif.	154	100	34	11	2	7	3
San Jose, Calif.§	175	155	1	3	7	4	13
Seattle, Wash.	145	99	27	8	7	4	4
Spokane, Wash.	55	39	12	1	1	2	3
Tacoma, Wash.	47	39	7	1	-	-	6
TOTAL	11,315††	7,375	2,368	794	386	367	478

* 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.

Allergies – Continued

a battery-powered, air-purifying respirator prevented their occurrence. Serologic testing for antibodies to standard fungal antigens was negative. Skin tests for allergies to house dust, house-dust mite, molds, moth scales, and adult and larval stages of the screwworm fly were also negative. An extract of the larval stage of the *Heliothis* moth caused a positive skin reaction. The employee stopped working with *Heliothis* species, and the symptoms did not recur.

Case 2: A worker experienced nasal irritation and congestion, cough, and episodes of shortness of breath with chest tightness within one-half hour after exposure to scales and "frass" (debris or excrement) from several insects. After working for 2 years with *Anthonomus grandis* (boll weevil), the worker, because of these symptoms, was transferred to a job that involved working with *Heliothis* species. The symptoms recurred within 3 years of working with moths, and resolved after transfer to a job involving work with *Musca domestica* (housefly). The symptoms occurred again within 2 years' work with this insect. Symptoms recurred within 5 months after another job change to work with *Cochliomyia homonivorax* (screwworm) species. The worker's serum immunoglobulin E level was markedly elevated to 2,060 (normal less than 780), and eosinophil counts were elevated. Chest x-ray and pulmonary-function tests, including methacholine challenge, were normal. Allergy skin testing was positive for housefly and moth extracts and for extracts from the adult and larval stages of the screwworm fly. When the employee transferred to a job that did not involve insect-related work, the symptoms finally disappeared.

In November 1983, NIOSH reported results of the survey (*1*). Employees at 87% (85/98) of the ARS insect-raising facilities participated, representing 37 states; the overall response rate was 71% (753/1,062). Of those responding, 25% (190/753) reported current or past symptoms consistent with allergic reactions related to work. The most prevalent symptoms reported included sneezing or runny nose (73%), eye irritation (68%), skin irritation or skin rash (41%), cough (38%), wheezing (26%), and shortness of breath (24%). At 61% (52/85) of the respondent facilities, at least one employee reported current or past symptoms suggestive of work-related allergy; at five of the facilities, 10 or more employees reported such symptoms.

Of the entomologists and laboratory technicians who worked directly with insects, 33% (168/507) reported symptoms suggestive of work-related allergy, compared with 9% (22/246) of workers who had little or no direct contact with insects ($p < 0.001$).

Symptoms began within half an hour after arriving at work in 48% (92/190) of the affected employees and between one-half and 4 hours after arrival in another 30% (57/190). Sixty-six percent of workers (125/190) reported improvement in the evening after going home; improvement or complete resolution on weekends was reported by 74% (141/190) and on vacations by 82% (155/190). Forty-four percent (83/190) consulted physicians because of symptoms; treatment was prescribed for 83% (69/83). Twenty-two percent (41/190) of those reporting symptoms suggestive of work-related allergy either discontinued working with the insect thought responsible for their symptoms or transferred to another work area or job.

Respondents identified the cause of their symptoms as airborne insect material (83% [157/190]), direct contact with an insect or insect part (52% [99/190]), insect stings (6% [12/190]), and insect bites (4% [7/190]). The most frequently implicated insects were in the *Lepidoptera* order (moths and butterflies) (66% of 282 multiple responses). No work-related symptoms of allergy was reported in areas of one insectary that was specially constructed of waterproof concrete blocks so that all surfaces could be thoroughly cleaned three times a week with a pressurized wet-spray, wash-down method.

Reported by Div of Respiratory Disease Studies, National Institute for Occupational Safety and Health, CDC.

Allergies – Continued

Editorial Note: For many years, entomologists have recognized allergies associated with raising insects in confined spaces. Watery eyes, sneezing, and asthma were reported in 1918 by an entomologist raising the New Mexico range caterpillar (*2*); in 1965, symptoms of inhalant allergy were described by workers at a screwworm facility (*3*); in 1972, "terrible fits of asthma and itching eruptions of hands" were reported by entomologists working with cockroaches (*4*); investigation of allergic sensitivity in workers exposed to gypsy moths was reported in 1982 (*5*); and a case of hypersensitivity pneumonitis attributed to *Penicillium* mold was reported by an entomologist working at an insect-raising facility (*6*).

Employees in insect-raising facilities can be exposed to various potentially sensitizing airborne particulates, such as insect parts or excrement, components of culture media, and airborne bacteria or fungi. The relative importance of these agents in sensitizing the worker is not clear.

The symptoms observed in the NIOSH survey are consistent with results of a pilot survey conducted by the Insect Allergy Committee of the Entomological Society of America (*7*) and with other reports in the medical literature. Such reports indicate that eye irritation, respiratory symptoms (sneezing, cough, chest tightness), and skin irritation or rash are the major symptoms of insect allergy in these facilities (*8,9*). The findings are also consistent with results of outbreak investigations of allergic reactions occurring in the general population when the number of insects markedly increases (*5,9*).

Several measures are recommended to prevent sensitizing exposures of workers in insect-raising facilities: (1) segregating insect colonies in one building or in one part of a building; (2) designing facilities so that all surfaces can be readily washed down; (3) establishing a "single pass" air-handling system for insect-raising rooms independent of systems circulating air to the general laboratory area and office space; (4) equipping the independent air-handling system with high-efficiency particulate air filters; (5) substituting vertical laminar flow biologic safety cabinets for the horizontal laminar flow cabinets that cause air to pass across the insects toward the workers' faces; and (6) using laboratory coats and disposable gloves at all cabinets and insect-handling work stations. Protective devices—such as battery-powered, air-purifying, full-face respirators—may reduce the potential for contact of airborne allergens with mucous membranes but are considered less effective than environmental controls. Transfer to other jobs may be the only satisfactory alternative for hypersensitive workers with severe symptoms.

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Current Trends

Influenza Virus Activity — Texas, 1983-1984 Season

Analyses of reported cases of influenza, school absentee levels, and influenza virus isolates indicate that Texas experienced intense influenza activity in January and February 1984. The influenza epidemic was more severe, when measured by number of reported cases, than epidemics during the 1981-1982 and 1982-1983 seasons.

Cases of influenza are reported weekly by numeric totals to the Bureau of Epidemiology, Texas Department of Health, through a morbidity reporting system. This system encompasses over 500 reporting sources, including physicians, city and county health departments, and hospitals. Influenza viruses isolated in the state are reported through a virus surveillance system with 18 participating laboratories. A telephone surveillance system was used to ascertain levels of school absenteeism and operated from January through March 1984. Public school districts randomly chosen from an alphabetic listing were telephoned to determine total number of schools in the district, total enrollment at each school, and number absent at each school for each day of the epidemic. An absentee level of 10% or greater for any school on any day was considered positive evidence of influenza activity.

A total of 102,437 influenza cases were reported in February compared with fewer than 22,000 in February for each of the preceding 2 years. These 102,437 reported cases are the highest number of influenza cases reported to the Bureau of Epidemiology for any month since record collection began in 1920.

A total of 1,039 influenza viruses were isolated in Texas from November 1, 1983, through April 30, 1984. Seventy-two percent of these were isolated from specimens collected from January 22 through February 18 (weeks 4-7 of the epidemic). Influenza type A(H1N1) virus represented 50% of all influenza viruses reported. Influenza B and influenza A(H3N2) comprised 48% and 2%, respectively. In March, 82% of the influenza viruses reported were type B.

Two hundred forty-two districts, representing 903 schools in 209 counties, were contacted between January 2 and March 30. Over 40% of the 315 schools surveyed during January 22-February 18 experienced absentee levels greater than 10%; 9% had absentee levels greater than 20%. During January 29-February 4, 70% of the 79 schools surveyed had absentee levels above 10%. No districts contacted after March 11 reported a school with an absentee level of 10% or greater.

Reported by WP Glezen, MD, Influenza Research Center, Baylor College of Medicine, Houston, JP Taylor, MPH, JN Perdue, Bureau of Epidemiology, CE Alexander, MD, State Epidemiologist, Texas Dept of Health.

Editorial Note: This information from Texas documents the unusually high rate of influenza morbidity in association with widespread increases in school absenteeism in January and February and highlights at the state level the trends seen regionally and nationally during the past influenza season (*1*).

Reference

1. CDC. Influenza—United States, 1983-1984 season. MMWR 1984;33:417-21.

Errata: Vol. 33, No. 29

p. 421. In the article, "Mumps Outbreak—New Jersey," the last sentence of the first paragraph of the Editorial Note on page 429 should read: "Cases in 1982 decreased by 38% from 1982 (5,270 cases) and by 98% from 1967." The 5,310 cases given was the provisional total for 1982.

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p. 408. In the article, "Chromosomally Mediated Resistant *Neisseria gonorrhoeae*—United States," the third sentence of the third paragraph should read: Gonococcal isolates that grew on media containing 1.6 μg/ml of penicillin or produced a zone of inhibition less than 26 mm, with a 10-Unit penicillin disk, were submitted to CDC for confirmation of resistance.

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The data in this report 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.

The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: ATTN: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

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