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Current Trends

Recommendations for Preventing Transmission of Infection with Human T-Lymphotropic Virus Type III/ Lymphadenopathy-Associated Virus during Invasive Procedures

BACKGROUND

On November 15, 1985, "Recommendations for Preventing Transmission of Infection with Human T-Lymphotropic Virus Type III/Lymphadenopathy-Associated Virus in the Workplace," was published (*1*). That document gave particular emphasis to health-care settings and indicated that formulation of further specific recommendations for preventing human T-lymphotropic virus type III/lymphadenopathy-associated virus (HTLV-III/LAV) transmission applicable to health-care workers (HCWs) who perform invasive procedures was in progress.

Toward that end, a 2-day meeting was held at CDC to discuss draft recommendations applicable to individuals who perform or assist in invasive procedures.* Following the meeting, revised draft recommendations for HCWs who have contact with tissues or mucous membranes while performing or assisting in operative, obstetric, or dental invasive procedures were sent to participants for comment. In addition, 10 physicians with expertise in infectious diseases and the epidemiology of HTLV-III/LAV infection were consulted to determine whether they felt additional measures or precautions beyond those recommended below were indicated. These 10 experts did not feel that additional recommendations or precautions were indicated.

DEFINITIONS

In this document, an operative procedure is defined as surgical entry into tissues, cavities, or organs or repair of major traumatic injuries in an operating or delivery room, emergency

*The following organizations were represented at the meeting: American Academy of Family Physicians; American Academy of Periodontology; American Association of Dental Schools; American Association of Medical Colleges; American Association of Oral and Maxillofacial Surgeons; American Association of Physicians for Human Rights; American College of Emergency Physicians; American College of Nurse Midwives; American College of Obstetricians and Gynecologists; American College of Surgeons; American Dental Association; American Dental Hygienists Association; American Hospital Association; American Medical Association; American Nurses' Association; American Public Health Association; Association for Practitioners in Infection Control; Association of Operating Room Nurses; Association of State and Territorial Health Officials; Conference of State and Territorial Epidemiologists; U.S. Food and Drug Administration; Infectious Diseases Society of America; National Association of County Health Officials; National Dental Association; National Institutes of Health; National Medical Association; Nurses Association of the American College of Obstetricians and Gynecologists; Society of Hospital Epidemiologists of America; Surgical Infection Society; and United States Conference of Local Health Officers. In addition, a hospital administrator, a hospital medical director, and representatives from CDC participated in the meeting. These recommendations may not reflect the views of all individual consultants or the organizations they represented.

HTLV-III/LAV — Continued

department, or outpatient setting, including both physicians' and dentists' offices. An obstetric procedure is defined as a vaginal or cesarean delivery or other invasive obstetric procedure where bleeding may occur. A dental procedure is defined as the manipulation, cutting, or removal of any oral or perioral tissues, including tooth structure, where bleeding occurs or the potential for bleeding exists.

RECOMMENDATIONS

There have been no reports of HTLV-III/LAV transmission from an HCW to a patient or from a patient to an HCW during operative, obstetric, or dental invasive procedures. Nevertheless, special emphasis should be placed on the following precautions to prevent transmission of bloodborne agents between all patients and all HCWs who perform or assist in invasive procedures.

1. All HCWs who perform or assist in operative, obstetric, or dental invasive procedures must be educated regarding the epidemiology, modes of transmission, and prevention of HTLV-III/LAV infection and the need for routine use of appropriate barrier precautions during procedures and when handling instruments contaminated with blood after procedures.
2. All HCWs who perform or assist in invasive procedures must wear gloves when touching mucous membranes or nonintact skin of all patients and use other appropriate barrier precautions when indicated (e.g., masks, eye coverings, and gowns, if aerosolization or splashes are likely to occur). In the dental setting, as in the operative and obstetric setting, gloves must be worn for touching all mucous membranes and changed between all patient contacts. If a glove is torn or a needlestick or other injury occurs, the glove must be changed as promptly as safety permits and the needle or instrument removed from the sterile field.
3. All HCWs who perform or assist in vaginal or cesarean deliveries must use appropriate barrier precautions (e.g., gloves and gowns) when handling the placenta or the infant until blood and amniotic fluid have been removed from the infant's skin. Recommendations for assisting in the prevention of perinatal transmission of HTLV-III/LAV have been published (*2*).
4. All HCWs who perform or assist in invasive procedures must use extraordinary care to prevent injuries to hands caused by needles, scalpels, and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles; and when handling sharp instruments following procedures. After use, disposable syringes and needles, scalpel blades, and other sharp items must be placed in puncture-resistant containers for disposal. To prevent needlestick injuries, needles should not be recapped; purposefully bent or broken; removed from disposable syringes; or otherwise manipulated by hand. No data are currently available from controlled studies examining the effect, if any, of the use of needle-cutting devices on the incidence of needlestick injuries.
5. If an incident occurs during an invasive procedure that results in exposure of a patient to the blood of an HCW, the patient should be informed of the incident, and previous recommendations for management of such exposures (*1*) should be followed.
6. No HCW who has exudative lesions or weeping dermatitis should perform or assist in invasive procedures or other direct patient-care activities or handle equipment used for patient care.
7. All HCWs with evidence of any illness that may compromise their ability to adequately and safely perform invasive procedures should be evaluated medically to determine whether they are physically and mentally competent to perform invasive procedures.

HTLV-III/LAV — Continued

8. Routine serologic testing for evidence of HTLV-III/LAV infection is not necessary for HCWs who perform or assist in invasive procedures or for patients undergoing invasive procedures, since the risk of transmission in this setting is so low. Results of such routine testing would not practically supplement the precautions recommended above in further reducing the negligible risk of transmission during operative, obstetric, or dental invasive procedures.

Previous recommendations (*1,3,4*) should be consulted for: (1) preventing transmission of HTLV-III/LAV infection from HCWs to patients and patients to HCWs in health-care settings other than those described in this document; (2) preventing transmission from patient to patient; (3) sterilizing, disinfecting, housekeeping, and disposing of waste; and (4) managing parenteral and mucous-membrane exposures of HCWs and patients. Previously recommended precautions (*1*) are also applicable to HCWs performing or assisting in invasive procedures.

References

1. CDC. Recommendations for preventing transmission of infection with human T-lymphotropic virus type III/lymphadenopathy-associated virus in the workplace. MMWR 1985;34:682-6, 691-5.
2. CDC. Recommendations for assisting in the prevention of perinatal transmission of human T-lymphotropic virus type III/lymphadenopathy-associated virus and acquired immunodeficiency syndrome. MMWR 1985;34:721-6, 731-2.
3. CDC. Acquired immune deficiency syndrome (AIDS): precautions for clinical and laboratory staffs. MMWR 1982;31:577-80.
4. CDC. Acquired immunodeficiency syndrome (AIDS): precautions for health-care workers and allied professionals. MMWR 1983;32:450-1.

Epidemiologic Notes and Reports

Q Fever among Slaughterhouse Workers — California

During May 1985, five cases of hepatitis were reported to the Solano County (California) Health Department among workers at a local meatpacking plant that processes sheep. Illnesses were characterized by fever, malaise, myalgias, severe headache, and abdominal pain, but no jaundice. Symptoms lasted at least 1 week, then gradually resolved. Hepatitis was suspected because all cases had moderately elevated SGOT values. However, none had serologic evidence of acute infection with either hepatitis A or B (i.e., negative immunoglobulin M [IgM] antibody to hepatitis A and hepatitis B surface antigen). Since all five patients were exposed to domestic animals in the course of their work, the differential diagnoses included Q fever, brucellosis, and leptospirosis. Sera from four of the patients who were originally thought to have had hepatitis from other causes were positive for IgM antibody to Q fever by the immunofluorescent antibody test (IFA), indicating recent infection.

A serosurvey was conducted to identify the extent of the outbreak. Forty-two of approximately 100 employees agreed to be surveyed, including the five employees described above. Twelve (29%) had complement-fixation (CF) titers to Q fever rickettsiae; eight (67%) of the

Q Fever — Continued

12 had recently experienced a clinical illness compatible with Q fever. Nineteen (45%) of the surveyed employees were positive by IFA test (but negative by CF test) for IgG antibody. Eleven of the 42 employees were negative both by CF and IFA. The 31 persons with serologic evidence of infection worked in a variety of jobs in areas throughout the plant, but no further investigation was performed to determine areas of highest risk.

Employees were educated about the illness through printed material and a question-and-answer session. A letter was mailed to physicians in the vicinity of the meatpacking plant informing them about Q fever. An investigation conducted by the California Occupational Health and Safety Administration resulted in the implementation of a surveillance program that included screening for Q fever by serology and for valvular heart disease among new employees. No feasible environmental control measures were identified.

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Editorial Note: Q fever, caused by the rickettsial organism *Coxiella burnetii*, is found in at least 51 countries on five continents. The primary reservoirs are cattle, sheep, goats, and ticks, but many species of animals, both wild and domestic, are susceptible to infection. The infection in animals is usually subclinical, although organisms are excreted in milk, urine, and feces. In the infected parturient ewe, rickettsiae are found in especially high numbers in amniotic fluid, placenta, and fetal membranes (the placenta may contain 10^9 organisms per gram during late gestation) (*1*). A single inhaled organism is sufficient to initiate infection. Because they are extremely resistant to desiccation and to physical agents, organisms survive for long periods in the inanimate environment (*2*).

Humans are usually infected by inhalation of aerosolized particles from contaminated environments. Disease resulting from sheep occurs most commonly during the lambing season because of the high numbers of organisms shed at this time. Humans are at risk at other times as well, since the organism may be shed periodically from domestic animals and may be found in raw milk, arthropods, and other animal products, e.g., wool. Other occupational exposures to sheep have accounted for four reported outbreaks among employees in urban research facilities (*3*).

The incubation period for Q fever in humans is 14-39 days, averaging 20 days. Most commonly, Q fever causes a mild influenza-like illness that rarely requires medical attention. Q fever may manifest as a systemic illness, as in the first four cases, with symptoms characterized by sudden onset of severe headache, retrobulbar pain, a fever of 40 C (104 F) or greater, chills, general malaise, myalgia, and chest pain. Other more severe manifestations may include pneumonia and hepatitis. Although the acute disease is usually self-limited, Q fever endocarditis occassionally develops, typically 3-20 years following the acute infection, and is often fatal (*5,6*). Patients with underlying heart disease are at particular risk, because it affects previously damaged heart valves. Prompt treatment with tetracycline or chloramphenicol is effective in shortening the course of acute illness (*7*).

Q fever has also been described among children. Infection with *C. burnetii* was diagnosed in 18 children under 3 years of age who were hospitalized in the Netherlands during a 16-month period (*8*). These patients presented most commonly with fever of unknown etiology or with pneumonia. Four of the children had relapsing episodes of fever that lasted 2-11 months before presentation. The duration of hospitalization averaged 25 days, and ranged from 4 days to 80 days.

Q fever is difficult to diagnose clinically, and radiologic findings of the lungs, when present,

Q Fever — Continued

may not be diagnostic. However, the diagnosis is readily made serologically (*9,10*).

Q fever is reportable in 24 states (Figure 1). Because Q fever may be mild and self-limited or mistaken for an acute viral illness, diagnosis requires a high index of suspicion. An occupational history should be obtained; contact with animals should suggest Q fever or another zoonoses. Q fever should be considered in the differential diagnosis of patients with atypical pneumonia, an influenza-like illness during periods of low influenza activity, in patients with abnormal liver function tests when serologic evidence for hepatitis A or B is absent, and in children with fever of unknown origin (*8*). To facilitate diagnosis, a pilot state laboratory-based Q fever surveillance program has been initiated in California, Colorado, Idaho, Iowa, Montana, New Mexico, and Oregon. Participating state laboratories have volunteered to test selected serum specimens for Q fever antibody. Positive specimens are reported both to the physician and to the state epidemiologist, who subsequently completes a case history form. Physicians in these seven states are encouraged to report such cases through their local/state health departments to the Viral and Rickettsial Zoonoses Branch, Division of Viral Diseases, Center for Infectious Diseases, CDC.

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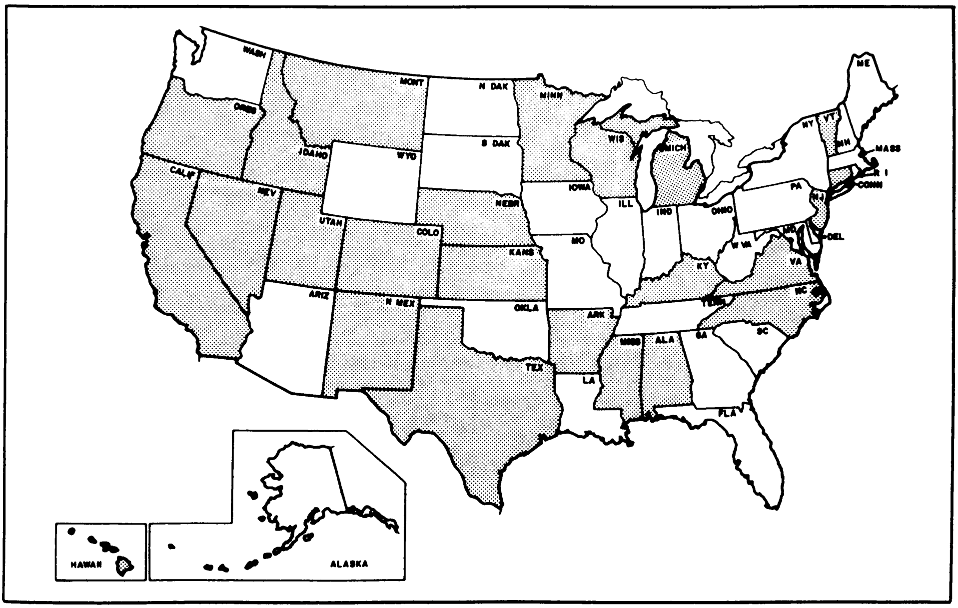
FIGURE 1. States that include Q fever on their official list of notifiable diseases



Q Fever — Continued

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

Disease	14th Week Ending			Cumulative, 14th Week Ending		
	Apr. 5, 1986	Apr. 6, 1985	Median 1981-1985	Apr. 5, 1986	Apr. 6, 1985	Median 1981-1985
Acquired Immunodeficiency Syndrome (AIDS)	293	92	N	3,208	1,679	N
Aseptic meningitis	78	70	70	1,119	968	1,086
Encephalitis: Primary (arthropod-borne & unspec.)	13	22	17	221	250	235
Post-infectious	2	4	2	19	35	24
Gonorrhea: Civilian	14,946	14,094	15,907	208,859	208,706	241,415
Military	213	200	471	4,107	5,059	6,483
Hepatitis: Type A	396	420	407	5,998	5,705	6,159
Type B	527	522	427	6,512	6,597	6,098
Non A, Non B	89	69	N	874	1,106	N
Unspecified	81	93	149	1,356	1,359	1,966
Legionellosis	11	9	N	150	165	N
Leprosy	7	6	6	71	108	57
Malaria	23	14	16	188	181	181
Measles: Total*	94	70	69	1,433	617	617
Indigenous	91	48	N	1,393	501	N
Imported	3	22	N	40	116	N
Meningococcal infections: Total	61	52	81	884	846	974
Civilian	61	52	80	882	845	973
Military	-	-	-	2	1	3
Mumps	96	87	85	801	1,132	1,153
Pertussis	28	24	28	515	401	401
Rubella (German measles)	15	20	23	132	104	310
Syphilis (Primary & Secondary): Civilian	415	434	608	6,376	6,618	8,159
Military	4	7	4	56	50	99
Toxic Shock syndrome	7	6	N	80	102	N
Tuberculosis	390	359	440	5,055	4,928	5,737
Tularemia	-	-	3	17	24	25
Typhoid fever	9	7	7	60	66	99
Typhus fever, tick-borne (RMSF)	2	3	3	15	14	18
Rabies, animal	90	116	141	1,247	1,195	1,404

TABLE II. Notifiable diseases of low frequency, United States

	Cum 1986		Cum 1986
Anthrax	-	Leptospirosis	13
Botulism: Foodborne	3	Plague	-
Infant (Calif. 2)	14	Poliomyelitis, Paralytic	-
Other	-	Psittacosis (Calif. 2)	16
Brucellosis (N. Y. City 1)	13	Rabies, human	-
Cholera	-	Tetanus (N. J. 1, Ga. 1)	10
Congenital rubella syndrome	1	Trichinosis	7
Congenital syphilis, ages < 1 year	11	Typhus fever, flea-borne (endemic, murine) (Calif. 4)	5
Diphtheria	-		

*Two of the 94 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 April 5, 1986 and April 6, 1985 (14th Week)

Reporting Area	AIDS	Aseptic Menin-gitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel-losis	Leprosy
			Primary	Post-in-fectious			A	B	NA,NB	Unspeci-fied		
	Cum. 1986	1986	Cum. 1986	Cum. 1986	Cum. 1986	Cum. 1985	1986	1986	1986	1986	1986	Cum. 1986
UNITED STATES	3,208	78	221	19	208,859	208,706	396	527	89	81	11	71
NEW ENGLAND	129	1	10	1	4,885	6,685	19	44	1	8	-	1
Maine	6	-	-	-	243	263	-	-	-	-	-	-
N.H.	6	-	2	-	141	135	-	-	-	-	-	-
Vt.	2	-	2	1	78	61	-	1	-	-	-	-
Mass.	72	1	3	-	2,074	2,512	7	35	1	8	-	1
R.I.	9	-	-	-	455	484	2	3	-	-	-	-
Conn.	34	-	3	-	1,894	3,230	10	5	-	-	-	-
MID ATLANTIC	1,227	6	36	-	37,373	27,678	24	29	3	6	-	7
Upstate N.Y.	103	3	12	-	4,089	4,146	15	17	1	-	-	-
N.Y. City	837	-	9	-	22,495	11,822	-	-	-	6	-	7
N.J.	199	-	4	-	4,270	6,090	9	12	2	-	-	-
Pa.	88	3	11	-	6,519	5,620	-	-	-	-	-	-
E.N. CENTRAL	161	5	46	2	26,311	30,523	33	46	6	5	4	3
Ohio	30	1	15	2	7,421	7,557	18	22	2	3	2	-
Ind.	22	1	4	-	4,220	2,981	-	7	1	-	-	-
Ill.	70	2	6	-	3,821	8,994	9	7	1	1	-	2
Mich.	34	1	20	-	9,161	8,674	6	10	2	1	2	1
Wis.	5	-	1	-	1,688	2,317	-	-	-	-	-	-
W.N. CENTRAL	68	1	5	1	9,787	10,605	5	15	3	3	-	1
Minn.	29	-	3	-	1,420	1,577	1	-	-	-	-	1
Iowa	7	1	2	-	963	1,128	-	2	2	-	-	-
Mo.	20	-	-	-	4,793	4,902	2	13	1	3	-	-
N. Dak.	2	-	-	-	96	78	1	-	-	-	-	-
S. Dak.	1	-	-	-	195	189	-	-	-	-	-	-
Nebr.	3	-	-	-	696	1,027	1	-	-	-	-	-
Kans.	6	-	-	1	1,624	1,704	-	-	-	-	-	-
S. ATLANTIC	414	23	37	11	46,977	45,288	32	94	7	6	2	1
Del.	8	-	3	-	902	953	2	-	-	-	-	-
Md.	43	8	10	-	6,780	7,237	7	32	1	2	-	-
D.C.	70	-	-	-	4,222	3,688	1	1	-	-	-	-
Va.	47	4	14	-	4,742	4,839	1	4	1	1	-	1
W. Va.	2	1	4	-	651	588	-	-	-	-	-	-
N.C.	21	4	5	1	9,368	8,670	2	3	-	-	1	-
S.C.	15	-	-	-	4,980	5,607	-	3	1	1	-	-
Ga.	27	2	-	-	-	-	5	18	1	-	-	-
Fla.	181	4	1	10	15,332	13,706	14	33	3	2	1	-
E.S. CENTRAL	32	11	16	1	18,328	18,583	4	33	9	2	2	-
Ky.	10	3	6	-	2,197	2,042	-	7	2	-	2	-
Tenn.	13	2	1	1	7,224	7,290	-	11	2	1	-	-
Ala.	5	6	9	-	5,038	5,760	2	13	5	1	-	-
Miss.	4	-	-	-	3,869	3,491	2	2	-	-	-	-
W.S. CENTRAL	275	9	17	-	26,872	29,538	43	46	15	26	2	5
Ark.	9	-	-	-	2,522	2,801	3	4	-	1	-	-
La.	34	3	1	-	4,719	6,116	2	3	1	-	-	-
Okla.	11	1	4	-	3,087	2,971	8	8	5	2	-	-
Tex.	221	5	12	-	16,544	17,650	30	31	9	23	2	5
MOUNTAIN	79	4	10	1	6,928	6,867	35	42	9	6	-	7
Mont.	1	-	-	1	175	210	-	-	-	-	-	-
Idaho	1	-	-	-	232	239	1	-	1	-	-	-
Wyo.	2	-	2	-	159	188	2	-	-	-	-	-
Colo.	36	3	2	-	1,711	2,029	2	5	-	2	-	3
N. Mex.	6	-	-	-	718	816	8	11	-	-	-	-
Ariz.	18	-	4	-	2,187	2,033	17	18	8	4	-	2
Utah	6	-	1	-	290	276	3	2	-	-	-	-
Nev.	9	1	1	-	1,456	1,076	2	6	-	-	-	2
PACIFIC	823	18	44	2	31,398	32,939	201	178	36	19	1	46
Wash.	34	2	4	-	2,374	2,385	12	21	4	-	1	5
Oreg.	14	-	-	-	1,229	1,738	40	12	2	-	-	-
Calif.	757	16	38	2	26,561	27,473	148	141	30	18	-	37
Alaska	8	-	2	-	879	827	-	3	-	1	-	-
Hawaii	10	-	-	-	355	516	1	1	-	-	-	4
Guam	-	-	-	-	22	46	1	-	-	2	-	1
P.R.	30	2	2	-	615	1,068	1	1	-	10	-	-
V.I.	-	-	-	-	61	115	1	-	-	-	-	-
Pac. Trust Terr.	-	-	-	-	26	235	6	-	-	1	-	1
Amer. Samoa	-	-	-	-	8	-	2	-	-	-	-	-

N: Not notifiable U: Unavailable

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 5, 1986 and April 6, 1985 (14th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported *		Total									
	Cum. 1986	1986	Cum. 1986	1986	Cum. 1986	Cum. 1985	Cum. 1986	1986	Cum. 1986	1986	Cum. 1986	Cum. 1985	1986	Cum. 1986	Cum. 1985
UNITED STATES	188	91	1,393	3	40	617	884	96	801	28	515	401	15	132	104
NEW ENGLAND	11	-	9	-	-	40	64	11	25	3	35	18	-	1	5
Maine	-	-	-	-	-	-	11	-	-	-	2	2	-	-	-
N.H.	-	-	-	-	-	-	3	-	5	2	14	11	-	1	2
Vt.	1	-	-	-	-	-	9	-	-	-	1	2	-	-	-
Mass.	6	-	9	-	-	40	14	-	1	-	9	2	-	-	3
R.I.	1	-	-	-	-	-	8	-	4	-	1	1	-	-	-
Conn.	3	-	-	-	-	-	19	11	15	1	8	-	-	-	-
MID ATLANTIC	24	33	501	-	3	41	153	2	52	6	74	53	-	23	28
Upstate N.Y.	3	-	1	-	2	19	42	2	21	6	47	29	-	15	6
N.Y. City	7	23	76	-	1	20	36	-	5	-	5	7	-	5	7
N.J.	3	10	424	-	-	2	25	-	10	-	4	1	-	3	3
Pa.	11	-	-	-	-	-	50	-	16	-	18	16	-	-	12
E.N. CENTRAL	4	2	138	-	2	237	106	53	376	4	121	65	-	1	9
Ohio	1	-	-	-	-	11	51	4	49	3	62	13	-	-	-
Ind.	-	-	-	-	-	1	10	1	15	-	9	11	-	-	-
Ill.	2	2	78	-	-	138	26	37	189	-	14	11	-	-	3
Mich.	1	-	-	-	-	48	19	11	60	1	13	7	-	-	5
Wis.	-	-	60	-	2	39	-	-	63	-	23	23	-	1	1
W.N. CENTRAL	5	5	70	-	-	4	42	1	23	-	27	36	-	2	7
Minn.	2	-	-	-	-	1	10	-	1	-	15	11	-	-	-
Iowa	1	-	-	-	-	-	6	1	6	-	4	1	-	-	-
Mo.	2	-	-	-	-	2	18	-	7	-	3	8	-	1	-
N. Dak.	-	-	-	-	-	-	-	-	2	-	2	6	-	-	-
S. Dak.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Nebr.	-	-	-	-	-	-	6	-	-	-	-	1	-	-	-
Kans.	-	5	70	-	-	1	2	-	6	-	3	9	-	1	7
S. ATLANTIC	23	34	222	2	4	36	196	3	64	7	99	94	-	6	7
Del.	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Md.	3	1	6	2 †	2	3	23	-	4	1	21	25	-	-	1
D.C.	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
Va.	6	-	-	-	-	12	36	-	9	-	9	2	-	-	-
W. Va.	-	-	-	-	-	2	2	-	23	-	2	-	-	-	-
N.C.	3	-	-	-	-	-	32	-	4	2	15	7	-	-	-
S.C.	-	33	205	-	-	-	24	1	7	-	2	-	-	-	2
Ga.	3	-	-	-	1	8	29	1	5	2	42	45	-	-	-
Fla.	8	-	11	-	1	10	47	1	12	2	8	15	-	6	4
E.S. CENTRAL	4	-	-	-	-	-	45	2	7	1	15	4	-	1	1
Ky.	2	-	-	-	-	-	6	-	2	-	1	1	-	1	1
Tenn.	-	-	-	-	-	-	21	2	3	1	5	1	-	-	-
Ala.	2	-	-	-	-	-	13	-	1	-	9	2	-	-	-
Miss.	-	-	-	-	-	-	5	-	1	-	-	-	-	-	-
W.S. CENTRAL	14	3	284	-	12	12	61	10	68	3	24	32	4	27	13
Ark.	-	-	265	-	-	-	8	1	6	-	1	7	-	-	1
La.	4	-	-	-	-	1	7	-	-	-	3	1	-	-	-
Okla.	1	-	2	-	-	-	10	N	N	3	20	24	-	-	-
Tex.	9	3	17	-	12	11	36	9	62	-	-	-	4	27	12
MOUNTAIN	5	10	48	1	6	168	35	3	94	1	68	20	-	-	3
Mont.	-	-	-	-	1	120	4	-	2	-	-	2	-	-	-
Idaho	1	-	-	-	-	-	1	-	2	-	15	-	-	-	1
Wyo.	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Colo.	1	-	-	1 §	3	-	7	-	4	-	16	8	-	-	-
N. Mex.	-	2	15	-	2	-	4	N	N	-	8	3	-	-	1
Ariz.	2	8	33	-	-	48	12	3	82	1	21	3	-	-	1
Utah	-	-	-	-	-	-	3	-	1	-	8	4	-	-	-
Nev.	1	-	-	-	-	-	2	-	3	-	-	-	-	-	-
PACIFIC	98	4	121	-	13	79	182	11	92	3	52	79	11	71	31
Wash.	9	1	23	-	7	1	24	-	4	-	23	11	1	1	-
Oreg.	8	-	-	-	2	2	14	N	N	-	2	16	-	-	1
Calif.	81	3	82	-	4	69	138	11	81	3	24	48	10	70	28
Alaska	-	-	-	-	-	-	5	-	2	-	1	2	-	-	-
Hawaii	-	-	16	-	-	7	1	-	5	-	2	2	-	-	2
Guam	1	1	2	-	-	10	-	-	1	-	-	-	-	2	1
P.R.	1	-	-	-	-	40	2	-	14	-	2	1	-	-	4
V.I.	-	-	-	-	-	9	-	-	6	-	-	-	-	-	-
Pac. Trust Terr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*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 April 5, 1986 and April 6, 1985 (14th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1986	Cum. 1985	1986	Cum. 1986	Cum. 1985	Cum. 1986	Cum. 1986	Cum. 1986	Cum. 1986
UNITED STATES	6,376	6,618	7	5,055	4,928	17	60	15	1,247
NEW ENGLAND	135	148	1	155	173	-	2	1	1
Maine	9	5	-	17	14	-	-	-	-
N.H.	6	3	1	3	6	-	-	-	-
Vt.	4	-	-	7	2	-	-	-	-
Mass.	67	80	-	77	104	-	1	1	-
R.I.	8	5	-	5	16	-	-	-	1
Conn.	41	55	-	46	31	-	1	-	-
MID ATLANTIC	932	877	1	980	970	-	6	1	117
Upstate N.Y.	47	61	-	155	132	-	1	1	19
N.Y. City	522	565	-	492	528	-	4	-	-
N.J.	188	186	1	165	87	-	1	-	-
Pa.	175	65	-	168	223	-	-	-	98
E.N. CENTRAL	164	331	1	655	620	-	4	-	22
Ohio	34	29	-	94	123	-	-	-	2
Ind.	38	28	-	77	74	-	-	-	6
Ill.	39	178	-	287	276	-	-	-	4
Mich.	35	81	1	159	115	-	3	-	3
Wis.	18	15	-	38	32	-	1	-	7
W.N. CENTRAL	65	74	-	140	133	6	3	-	155
Minn.	8	19	-	30	23	-	1	-	13
Iowa	5	11	-	11	21	1	-	-	37
Mo.	37	28	-	78	62	5	2	-	16
N. Dak.	2	-	-	3	2	-	-	-	42
S. Dak.	-	4	-	2	5	-	-	-	40
Nebr.	8	3	-	4	7	-	-	-	5
Kans.	5	9	-	12	13	-	-	-	2
S. ATLANTIC	1,656	1,671	1	1,016	976	4	6	5	327
Del.	10	14	-	12	9	-	-	-	-
Md.	131	129	-	76	81	1	-	-	191
D.C.	104	88	-	42	42	-	-	-	-
Va.	132	89	-	92	77	1	2	1	56
W. Va.	3	2	-	38	22	-	-	-	8
N.C.	149	194	-	137	107	1	2	2	-
S.C.	178	220	1	129	127	-	-	2	10
Ga.	-	-	-	118	145	1	-	-	41
Fla.	949	935	-	372	366	-	2	-	21
E.S. CENTRAL	456	602	2	448	425	3	-	5	71
Ky.	25	21	1	125	90	2	-	1	23
Tenn.	181	156	-	126	130	1	-	-	30
Ala.	154	208	1	147	151	-	-	1	18
Miss.	96	217	-	50	54	-	-	3	-
W.S. CENTRAL	1,476	1,610	-	628	490	3	2	3	163
Ark.	77	82	-	74	40	2	-	-	34
La.	237	281	-	125	82	-	-	-	4
Okla.	45	48	-	52	66	1	1	1	17
Tex.	1,117	1,199	-	377	302	-	1	2	108
MOUNTAIN	180	232	1	101	103	-	2	-	206
Mont.	3	1	1	5	16	-	-	-	81
Idaho	1	2	-	4	2	-	-	-	-
Wyo.	-	5	-	-	1	-	-	-	85
Colo.	53	53	-	1	11	-	-	-	-
N. Mex.	22	27	-	25	19	-	-	-	2
Ariz.	78	129	-	51	46	-	1	-	38
Utah	3	3	-	4	3	-	1	-	-
Nev.	20	12	-	11	5	-	-	-	-
PACIFIC	1,312	1,073	-	932	1,038	1	35	-	185
Wash.	16	39	-	52	47	-	2	-	-
Oreg.	27	27	-	35	34	-	-	-	-
Calif.	1,255	987	-	783	863	-	31	-	179
Alaska	-	-	-	12	44	1	-	-	6
Hawaii	14	20	-	50	50	-	2	-	-
Guam	1	2	-	-	12	-	-	-	-
P.R.	222	253	-	71	75	-	1	-	14
V.I.	-	1	-	-	1	-	-	-	-
Pac. Trust Terr.	12	15	-	7	23	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending April 5, 1986 (14th Week)

Reporting Area	All Causes, By Age (Years)						P&I** Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	756	547	129	34	21	25	74
Boston, Mass.	190	127	36	11	6	10	28
Bridgeport, Conn.	38	31	4	2	1	-	2
Cambridge, Mass.	28	26	2	-	-	-	7
Fall River, Mass.	31	22	8	-	1	-	-
Hartford, Conn.	84	60	13	3	2	6	6
Lowell, Mass.	31	24	4	2	1	-	3
Lynn, Mass.	20	14	6	-	-	-	-
New Bedford, Mass.	35	28	4	2	1	-	-
New Haven, Conn.	54	37	11	2	1	3	7
Providence, R.I.	68	50	11	4	1	2	5
Somerville, Mass.	9	8	1	-	-	-	2
Springfield, Mass.	42	29	7	2	3	1	3
Waterbury, Conn.	49	34	10	4	1	-	5
Worcester, Mass.	77	57	12	2	3	3	6
MID ATLANTIC	2,740	1,824	551	249	51	63	147
Albany, N.Y.	50	33	7	7	1	2	3
Allentown, Pa.	14	13	1	-	-	-	-
Buffalo, N.Y.	104	73	20	5	2	4	8
Camden, N.J.	46	33	8	2	-	3	3
Elizabeth, N.J.	31	23	7	1	-	-	1
Erie, Pa.†	43	28	13	2	-	-	1
Jersey City, N.J.	73	49	12	10	1	1	2
N.Y. City, N.Y.	1,340	875	255	155	31	24	62
Newark, N.J.	62	31	17	10	2	2	4
Paterson, N.J.	34	23	6	3	-	2	1
Philadelphia, Pa.	494	329	107	33	8	17	31
Pittsburgh, Pa.†	77	56	15	4	1	1	3
Reading, Pa.	31	25	3	2	1	-	4
Rochester, N.Y.	125	83	29	6	2	3	9
Schenectady, N.Y.	28	22	5	1	-	-	3
Scranton, Pa.†	34	24	8	1	1	-	3
Syracuse, N.Y.	81	54	22	3	1	1	5
Trenton, N.J.	19	9	6	2	-	2	1
Utica, N.Y.	26	19	6	-	-	1	2
Yonkers, N.Y.	28	22	4	2	-	-	1
E.N. CENTRAL	2,444	1,616	521	166	61	80	103
Akron, Ohio	70	49	15	2	1	3	2
Canton, Ohio	42	31	8	1	1	1	5
Chicago, Ill.§	556	354	125	42	12	23	17
Cincinnati, Ohio	150	99	36	8	5	2	13
Cleveland, Ohio	177	99	46	16	4	12	3
Columbus, Ohio	166	107	43	9	3	4	10
Dayton, Ohio	113	68	31	6	4	4	2
Detroit, Mich.	238	142	54	27	8	7	10
Evansville, Ind.	40	28	9	-	2	1	-
Fort Wayne, Ind.	61	49	8	2	1	1	6
Gary, Ind.	19	12	6	1	-	-	-
Grand Rapids, Mich.	71	48	11	2	4	6	8
Indianapolis, Ind.	226	142	54	15	7	8	5
Madison, Wis.	40	28	9	2	1	-	3
Milwaukee, Wis.	139	110	15	10	1	3	5
Peoria, Ill.	43	35	5	2	-	1	1
Rockford, Ill.	50	37	5	4	1	3	3
South Bend, Ind.	54	37	9	6	1	1	4
Toledo, Ohio	120	82	25	8	5	-	4
Youngstown, Ohio	69	59	7	3	-	-	2
W.N. CENTRAL	762	527	148	44	16	27	39
Des Moines, Iowa	62	47	8	5	-	2	7
Duluth, Minn.	22	14	3	1	-	4	-
Kansas City, Kans.	38	28	7	2	1	-	1
Kansas City, Mo.	130	91	27	5	6	1	8
Lincoln, Nebr.	36	26	7	3	-	-	1
Minneapolis, Minn.	88	58	17	7	3	3	4
Omaha, Nebr.	101	69	20	3	1	8	11
St. Louis, Mo.	156	105	31	11	4	5	2
St. Paul, Minn.	62	36	16	5	1	4	3
Wichita, Kans.	67	53	12	2	-	-	2
S. ATLANTIC	1,406	878	317	122	48	40	60
Atlanta, Ga.	154	89	43	14	6	2	3
Baltimore, Md.	283	175	68	25	9	6	10
Charlotte, N.C.	78	51	13	10	1	3	6
Jacksonville, Fla.	112	66	29	7	9	1	2
Miami, Fla.	109	57	22	17	8	5	4
Norfolk, Va.	47	35	8	2	1	1	3
Richmond, Va.	88	57	23	5	2	1	3
Savannah, Ga.	65	47	8	5	3	2	2
St. Petersburg, Fla.	101	83	13	3	-	2	12
Tampa, Fla.	82	51	17	7	4	2	9
Washington, D.C.	255	143	67	26	4	15	5
Wilmington, Del.	32	24	6	1	1	-	1
E.S. CENTRAL	797	518	179	57	23	20	53
Birmingham, Ala.	152	85	46	12	5	4	6
Chattanooga, Tenn.	67	41	13	7	5	1	9
Knoxville, Tenn.	89	62	21	3	2	1	10
Louisville, Ky.	91	60	15	7	2	7	8
Memphis, Tenn.	162	118	28	14	1	1	8
Mobile, Ala.	66	45	14	4	2	1	5
Montgomery, Ala.	45	27	10	1	5	2	-
Nashville, Tenn.	125	80	32	9	1	3	7
W.S. CENTRAL	1,534	954	336	140	53	51	57
Austin, Tex.	68	43	7	9	6	3	1
Baton Rouge, La.	50	25	14	5	6	-	2
Corpus Christi, Tex §	42	31	8	3	-	-	1
Dallas, Tex.	179	102	47	17	7	6	3
El Paso, Tex.	56	45	8	-	1	2	5
Fort Worth, Tex.	109	68	25	10	5	1	3
Houston, Tex §	429	266	95	38	12	18	13
Little Rock, Ark.	75	47	18	7	1	2	8
New Orleans, La.	148	100	26	16	4	2	-
San Antonio, Tex.	161	102	32	14	5	8	13
Shreveport, La.	85	47	20	11	-	7	3
Tulsa, Okla.	132	78	36	10	6	2	5
MOUNTAIN	758	471	147	67	33	39	43
Albuquerque, N.Mex.	102	63	12	16	9	1	9
Colo. Springs, Colo.	46	29	6	6	-	5	3
Denver, Colo.	120	69	18	11	6	16	4
Las Vegas, Nev.	96	54	27	13	-	2	7
Ogden, Utah	29	15	10	1	2	1	-
Phoenix, Ariz.	161	106	35	6	7	7	6
Pueblo, Colo.	22	15	3	2	1	1	3
Salt Lake City, Utah	55	36	10	2	2	5	-
Tucson, Ariz.	127	84	26	10	6	1	11
PACIFIC	1,955	1,248	421	155	66	55	116
Berkeley, Calif.	10	9	1	-	-	-	-
Fresno, Calif.	77	53	13	2	6	3	6
Glendale, Calif. §	30	26	3	1	-	-	2
Honolulu, Hawaii	105	66	27	6	3	3	8
Long Beach, Calif.	77	47	22	5	2	1	12
Los Angeles, Calif. §	586	370	123	55	23	7	23
Oakland, Calif.	73	46	20	5	1	1	2
Pasadena, Calif.	21	17	2	-	-	2	2
Portland, Oreg.	138	91	28	11	5	3	6
Sacramento, Calif.	127	80	26	12	4	5	3
San Diego, Calif.	149	90	32	11	8	8	18
San Francisco, Calif.	154	93	34	20	1	6	11
San Jose, Calif.	149	87	43	9	5	4	12
Seattle, Wash.	150	101	27	12	5	5	5
Spokane, Wash.	58	37	10	4	2	4	5
Tacoma, Wash.	51	35	10	2	1	3	1
TOTAL	13,152††	8,583	2,749	1,034	372	400	692

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

** Pneumonia and influenza.

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

†† Total includes unknown ages.

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

Current Trends

Safety of Therapeutic Immune Globulin Preparations with Respect to Transmission of Human T-Lymphotropic Virus Type III/Lymphadenopathy-Associated Virus Infection

Immune globulins produced by plasma fractionation methods approved for use in the United States have not been implicated in the transmission of infectious agents. Nevertheless, because immune globulins manufactured before 1985 were derived from plasma of human donors who were not screened for antibody to human T-lymphotropic virus type III/ lymphadenopathy-associated virus (HTLV-III/LAV), CDC and the U.S. Food and Drug Administration (FDA) have received inquiries concerning the safety of immune globulin (IG), hepatitis B immune globulin (HBIG), and intravenous immune globulin (IVIG). Current epidemiologic and laboratory evidence shows that these preparations carry no discernable risk of transmitting HTLV-III/LAV infection and that current indications for their clinical use should not be changed based on such concerns.

BACKGROUND

The IG, HBIG, IVIG, and other special immune globulins used in the United States are produced by several manufacturers using the Cohn-Oncley fractionation process (*1,2*). This process involves a series of precipitation steps performed in the cold with addition of varying concentrations of ethanol. Production lots of IG and IVIG are made from plasma pools from at least 1,000 donors; HBIG and other specific immune globulins (e.g., varicella-zoster IG) may be prepared from plasma pools from fewer donors.

Before 1985, donors were screened only for hepatitis B surface antigen but not by other tests for specific diagnosis of viral infections. Since April 1985, all donor units also have been screened for antibodies to HTLV-III/LAV, and all repeatedly reactive units have been discarded. Tests conducted at FDA and CDC have shown that as many as two-thirds of HBIG lots, as well as some lots of IG and IVIG, produced between 1982 and 1985 may have been positive for HTLV-III/LAV antibody. The question of safety arises out of concern that some immune globulins currently available were prepared from plasma pools that included units from donors who may have had HTLV-III/LAV viremia.

EPIDEMIOLOGIC STUDIES

Several studies have shown that recipients of HBIG and IG, including recipients of lots known to be positive for antibody to HTLV-III/LAV, did not seroconvert to antibody to HTLV-III/ LAV-positivity and have not developed signs and symptoms of acquired immunodeficiency syndrome (AIDS) or other illnesses suggesting HTLV-III/LAV infection.

Since August 1983, CDC has enrolled 938 individuals who have had parenteral or mucous-membrane exposures to blood or body fluids of AIDS patients in a prospective surveillance study. To date, 451 entrants have been followed and tested for HTLV-III/LAV antibody. Of these, 183 persons received IG and/or HBIG as prophylaxis against hepatitis B infection; 100 (55%) received only IG; 65 (36%) received only HBIG; and 18 (10%) received both. One of the 183 HBIG recipients is now positive for HTLV-III/LAV antibody, but no preexposure serum was available for this individual, and seropositivity may have predated the needlestick exposure and IG prophylaxis. Further, heterosexual transmission of HTLV-III/LAV infection in this individual cannot be ruled out. No documented seroconversions have occurred in any of the 183 health-care workers who received IG or HBIG.

Studies have been reported of 16 subjects who received HBIG that was strongly positive for HTLV-III/LAV antibody (*3*). Each patient had been given one to five ampules. A total of 31

Immune Globulins — Continued

doses were administered to 16 individuals. Low levels of passively acquired HTLV-III/LAV antibody were detected shortly after injection, but reactivity did not persist. Six months after the last HBIG injection, none of the 16 individuals had antibody to HTLV-III/LAV.

In a study of prophylaxis against cytomegalovirus (CMV) infections among kidney-transplant patients, 16 patients received CMV-specific IVIG preparations subsequently found to contain HTLV-III/LAV antibody. After 10 months or longer of follow-up, none of the 16 recipients developed antibody or other evidence of HTLV-III/LAV infection.

In studies of a group of IVIG recipients, most of whom had idiopathic thrombocytopenia, none of 134 patients developed antibodies or other evidence of HTLV-III/LAV infection.

Information regarding past therapy with immune globulins is available from 10,227 of 17,115 AIDS patients reported to CDC. Three hundred fifty-eight (4%) reported receipt of an IG preparation. All but seven of these patients also were members of groups known to be at high risk for developing AIDS. The percentage of patients with no recognized risk factors for AIDS was not significantly different among those who received immune globulins (7/358 [2%]) than among those who did not (358/9,869 [4%]).

LABORATORY STUDIES

Scientists at FDA recently evaluated the basic fractionation processes (*1,2*) used for production of immune globulins to determine effectiveness of those procedures in eliminating HTLV-III/LAV infectivity (*4*). Six sequential steps in a typical process were evaluated. The study was designed so that efficiency of eliminating HTLV-III/LAV at each step was measured. The degree to which HTLV-III/LAV was reduced by partitioning or inactivation at individual steps ranged from 10^{-1} to more than 10^{-4} of in vitro infectious units (IVIU)/ml. The effectiveness of virus removal in the entire process by partitioning and inactivation was calculated to be greater than 1×10^{15} IVIU/ml.

Concentrations of infectious HTLV-III/LAV in plasma of infected persons have been estimated to be less than 100 IVIU/ml. Further, FDA scientists have shown that the geometric mean infectivity titer of plasma from 43 HTLV-III/LAV infected persons was 0.02 IVIU/ml (*4*). Thus, the margin of safety based on the removal of infectivity by the fractionation process is extremely high.

Scientists at CDC and FDA also cultured 38 lots of HBIG, IVIG, and IG, most of which contained HTLV-III/LAV antibody. HTLV-III/LAV was not recovered from any lot tested.

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Editorial Note: The laboratory and epidemiologic studies referred to have shown that concern about HTLV-III/LAV infection associated with the use of immune globulins available in the United States is not warranted. Strategies for using immune globulins recommended by the Immunization Practices Advisory Committee should be followed (*5*).

Recently, concern has been expressed that patients who received IG prepared from plasma of donors not screened for HTLV-III/LAV antibody may have a passively acquired false-positive reaction for antibody (*6*). Passively acquired HTLV-III/LAV antibody from HBIG known to contain high levels of antibody has been reported (*3*). Based on the estimated half-life of globulins in plasma, it can be calculated that passively acquired antibodies might be detected in sera of recipients for as long as 6 months after administration of immune globulins. It is important to recognize this possibility when attempting to determine the significance of HTLV-III/LAV antibody in a person who has recently received immune globulins, especially HBIG.

Immune Globulins — Continued

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Epidemiologic Notes and Reports

Tornado Disaster — Pennsylvania

On the afternoon and evening of May 31, 1985, 27 tornadoes swept across parts of Ohio, Pennsylvania, western New York, and Ontario, killing at least 91 persons, injuring more than 800 others, and leaving thousands more homeless. This disaster was the worst tornado storm in the United States since April 1974, when 315 people were killed by twisters that swept through 11 states, causing damage totaling more than $600 million.

In Pennsylvania, the hardest-hit state, these tornadoes resulted in 65 dead, 700 injured, 1,000 homes destroyed, and hundreds of millions of dollars in property damage. The 13 tornadoes that struck Pennsylvania ranged in speed from 75 mph to 250 mph, in width from 100 yards to 2 miles, and in distance on the ground from 4 to 56 miles. According to the Pennsylvania Emergency Management Agency, Pennsylvania has averaged eight tornadoes a year since 1953. The 1985 tornadoes were the worst to hit the state since record-keeping began in 1854. The worst previous tornado had been in June 1944, when 45 people were killed, 362 injured, and 800 homes damaged in the southwestern part of the state.

Previously, CDC evaluated tornado disasters in Texas (*1*), Illinois (*2*), and the Carolinas (*3*). These studies assessed various factors hypothesized to influence the risk of injury from tornadoes. For the Pennsylvania tornado disaster, a study was designed to document information on deaths and hospitalizations to evaluate selected factors that may influence why some people die from their injuries, while others do not. The study focused on five contiguous counties (Erie, Crawford, Mercer, Venango, and Forest) that were hardest hit (46 of the 65 fatalities). Due to the total relocation of highly affected neighborhoods and the inability to identify a representative sampling frame for uninjured persons in the immediate post-tornado period, the study looked at fatally injured and hospitalized injured persons. The latter were frequency matched to fatally injured persons 2:1 on two variables, tornado track and age stratum, and compared to detect risk factors for lethality. Public health nurses from the Pennsylvania Northwestern District Health Department were trained to use a standardized questionnaire and conducted the in-

Tornado Disaster — Continued

terviews in person whenever possible. Interviews were completed with respondents (next-of-kin, neighbor) for 89% of the fatally injured and with respondents (self, next-of-kin) for 90% of the hospitalized persons.

Certain demographic and impact-phase characteristics (age, sex, location, protective warning, and protective measures) have been found in previous studies to be risk factors for injury; however, in this study, these characteristics did not appear to explain severity of injury (Table 1). Assessment of injury outcome characteristics in this study revealed that fatally injured persons were more likely to sustain injuries to the head and/or neck than were seriously injured persons. Further review of fatally injured persons showed that all but a few appeared to have been killed "instantaneously" and did not die en route to or in hospitals.

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Editorial Note: Public health consequences of tornadoes are very important in the United

TABLE 1. Percentage distribution of selected risk factors among hospitalized and fatally injured persons in a tornado disaster — western Pennslyvania, 1985

Risk factor	Fatally injured (n = 41)	Hospitalized (n = 83)
Sex		
Female	56.1	53.0
Male	43.9	47.0
Location		
Inside home	56.1	77.1
Working outside	2.4	1.2
Shopping	2.4	0.0
Recreation inside	2.4	0.0
Recreation outside	4.9	6.0
In car	9.8	8.4
Other	2.4	4.8
Unknown	19.5	2.4
First warning of tornado		
Saw tornado, high winds, or flying debris	19.5	36.1
Heard tornado	12.2	12.0
Saw alert on TV	2.4	9.6
Heard by word of mouth	12.2	14.5
Heard by telephone	2.4	2.4
Heard siren	0.0	2.4
Other	7.3	14.5
Unknown	43.9	8.4
Victim warned of tornado		
Yes	26.8	30.1
No	29.3	66.3
Unknown	43.9	3.6
Victim tried to warn others		
Yes	9.8	21.7
No	46.4	75.9
Unknown	43.9	2.4

Tornado Disaster — Continued

States. During the 1970s, 507 tornado-related disasters resulted in 830 persons killed, 20,969 persons injured, and 490,316 persons treated with emergency care (*4*).

The present study shows that, for selected known risk factors, fatally injured persons did not differ significantly from seriously injured (hospitalized) persons. Since deaths were usually "instantaneous," differences among postevent factors, recovery/transport times, and efficacy of emergency medical care do not appear to have contributed to fatal outcome. More likely explanations include differences in amounts of mechanical energy impacting critical body parts and/or unrecognized preevent or event-phase risk factors. Future research and public health attention should be geared to such preventive activities as early warning and education.

Overall statistics showed that 52% of the persons both fatally and seriously injured had less than 1 minute's warning, and 65% had less than 5 minutes' warning. Furthermore, 31% of the initial warnings to seriously injured persons consisted of the person seeing or hearing the tornado, high winds, or flying debris. In some other tornado disasters, citizens have had earlier and more explicit warnings (*1*).

This study also showed that only 34% of the seriously injured persons knew the difference between a tornado warning and a tornado watch. Another study has shown that 36% of persons who sighted tornadoes did not know what they were (*5*).

Further emphasis needs to be placed on public health strategies for preventing or mitigating tornado-associated morbidity and mortality in high-risk areas. Community action programs should be oriented towards disseminating tornado warning/watches from the National Weather Service and tornado education for citizens. This tornado disaster, along with the majority of all tornadoes, occurred during the late afternoon when radio/television audiences are at their lowest (*6*). Therefore, utilization of positive alerts (sirens) are important.

Citizens should be taught what the warning systems are in their communities and what should be done when the warning systems are activated. They should know and practice the following safety measures:

1. Persons in buildings should seek shelter indoors, on the lowest floor, preferably in a basement. Central rooms, including closets and stairwells, are safer than rooms along the outside of the house, and areas near windows should be avoided.
2. Drivers should not attempt to drive away from a tornado. Instead, they should seek shelter indoors immediately on hearing a tornado warning.
3. If drivers in open country cannot find indoor shelter, they should drive away from the tornado path at right angles. If there is not time to escape, persons outdoors should lie flat in the nearest ditch or ravine.
4. Even properly anchored mobile homes are unsafe when wind speeds exceed 50 mph. In tornado-prone states, mobile-home parks should have alternative tornado shelters.

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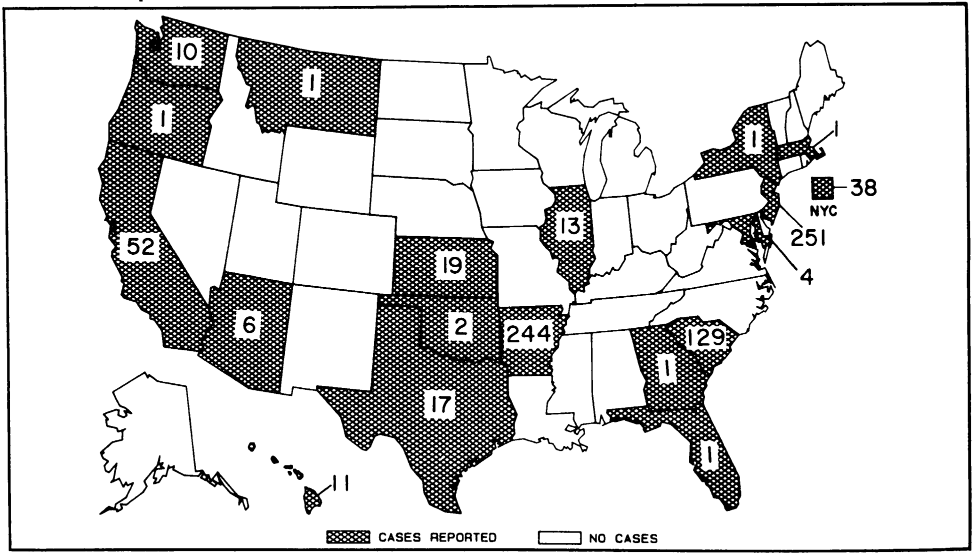
FIGURE I. Reported measles cases — United States, weeks 10-13, 1986



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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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