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Epidemiologic Notes and Reports

Enterically Transmitted Non-A, Non-B Hepatitis – Mexico

Two outbreaks of enterically transmitted non-A, non-B (ET-NANB) hepatitis occurred during the late summer and fall of 1986 in rural villages in the State of Morelos, Mexico. This is the first reported instance of epidemic transmission of this disease in the Americas.

Huitzililla, Morelos. In September 1986, an outbreak of hepatitis among adult residents of Huitzililla, Morelos, was reported to the Mexican Secretariat of Health. A census of the 1,757 inhabitants of this rural town identified 94 persons who had developed an illness with jaundice since June 1. Onsets were between June 5 and October 16, and the overall attack rate was 5%. The outbreak lasted 20 weeks, with the peak incidence in the second week of August (Figure 1). The first case occurred about 1 month after the seasonal rains began. Ninety-eight percent of the patients had anorexia and discolored urine; 97% had malaise; 87%, abdominal pain; 78%, arthralgias; and 53%, fever. Five of the six patients for whom sera were tested had abnormal liver-function tests (alanine aminotransferase [ALT]). Two patients, both nonpregnant adult women, died. One patient was a woman in the third trimester of pregnancy; neither she nor her infant suffered any detectable complications.

The attack rate was significantly higher for persons over 15 years of age (10%) than for younger persons (1%) ($p<0.01$) but did not vary significantly by sex. Attack rates by block of residence in the town varied widely and ranged from 0% to 29%, with the highest rates being in blocks that bordered on two small streams.

The town has no system for disposal of human feces, and, at the time of investigation, human fecal material was present on the banks of both streams. The wells of families living next to the streams were very shallow (3 to 6 feet). Nineteen (56%) of the 34 well-water samples tested exceeded 2 fecal coliforms per 100 ml.

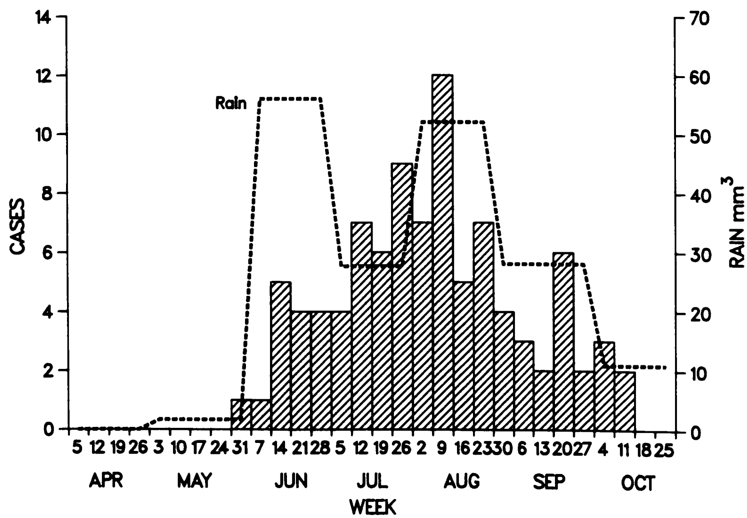
A case-control study was carried out to determine risk factors associated with illness. Thirty-two patients who had the initial case of hepatitis in their

Hepatitis — Continued

families were compared with 19 persons from families without illness. Illness was highly associated with water-related factors: families with illness were more likely than families without illness to have well-water with visible turbidity or particulate matter (91% compared with 21%; odds ratio [OR] = 36.3; 95% confidence interval [CI], 5.9 to 278.1); families with illness were less likely to have wells with protective walls (38% compared with 84%; OR = 0.11; 95% CI, 0.03 to 0.54) and were less likely to boil water for drinking (23% compared with 56%; OR = 0.23; 95% CI, 0.05 to 0.96). Contact with an ill member of a different household was also a significant risk factor. Other factors, such as consumption of specific foods and receipt of injections, were not associated with the risk of hepatitis.

Sera were collected from 62 patients and stools from 8 patients with recent onset of disease. Sixty (97%) of the serum samples were positive for antibody to hepatitis A virus (anti-HAV), but none had measurable IgM anti-HAV. None were positive for hepatitis B surface antigen (HBsAg); five (9%) were positive for antibody to hepatitis B core antigen (anti-HBc), but none were positive for IgM anti-HBc. Stool specimens were examined by immune electron microscopy (IEM) using sera from Asian patients with known ET-NANB hepatitis and sera from patients in this outbreak as an antibody source. Three of the 8 stools were positive for 28- to 34-nm viruslike particles similar to those seen by IEM in cases of ET-NANB hepatitis from Central Asia, Nepal, and Burma. In addition, a pool of the first four serum samples tested aggregated non-A, non-B hepatitis viruslike particles obtained from a patient during a recent outbreak in the Soviet Union.

FIGURE 1. Rainfall and cases of non-A, non-B hepatitis, by week — Huitzililla, Morelos, Mexico, June 1-October 31, 1986



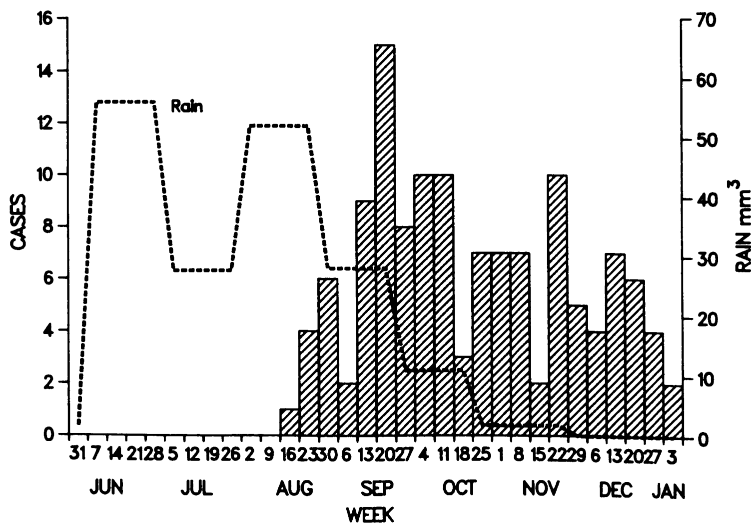
Hepatitis — Continued

Telixtac, Morelos. In October, while the outbreak in Huitzililla was being investigated, a cluster of hepatitis cases among young adults was reported from Telixtac, Morelos. Telixtac is a small rural community of 2,194 inhabitants about 30 miles from Huitzililla. A census identified 129 persons who had developed jaundice since June 1. Onsets were between August 20 and January 9, and the overall attack rate was 6%. This outbreak lasted 21 weeks, with the peak incidence occurring during the third week of September (Figure 2). The first case occurred about 3 months after the beginning of the seasonal rains in May. Ninety-three percent of the patients had discolored urine; 91% had malaise; 90%, anorexia; 85%, abdominal pain; 81%, arthralgias; and 62%, fever. All three patients for whom sera were tested had abnormal liver-function tests (ALT). One person, an adult nonpregnant woman, died. One pregnant woman was ill; she made an uneventful recovery, but, 15 days after onset of icterus, she delivered a premature infant of 32 weeks gestation. The infant weighed 2.2 kg and died at 3 months of age of unknown causes.

The attack rate was significantly higher for persons over 15 years of age (10%) than for younger persons (2%) ($p<0.01$) and did not vary by sex. Attack rates varied from 0% to 40% by block of residence.

At the time of the investigation, most families were getting their drinking water from deep irrigation wells located at the edge of the community. However, during the May through September rainy season, many families had gotten water from two small streams that run through the center of the village but that are dry most of the year. Like Huitzililla, Telixtac has no system for disposal of human feces.

FIGURE 2. Rainfall and cases of non-A, non-B hepatitis, by week — Telixtac, Morelos, Mexico, June 1, 1986-January 10, 1987



Hepatitis — Continued

A case-control study similar to the one in Huitzililla was performed. Fifty-four patients who had the initial case of hepatitis in their families were compared with 67 persons from families without illness. Families with illness were more likely than families without illness to obtain drinking water from the local stream (20% compared with 2%; OR = 16.9; 95% CI, 2.1 to 98.1); families with illness were also more likely to use stream water for cooking and washing dishes (16% compared with 2%; OR = 12.6, 95% CI, 1.5 to 84.6). No risk could be demonstrated for obtaining drinking water from any of the deep wells. Contact with an ill person outside the household was also a risk factor for illness, but other factors, such as consumption of specific foods, attendance at social events, and receipt of injections, were not significantly different between patients and controls.

Sera were collected from 53 patients and stools from 8 patients with recent onset of disease. All serum samples were positive for anti-HAV antibody; only two (4%) had detectable IgM anti-HAV. None were positive for HBsAg; only one was positive for anti-HBc, but this serum was negative for IgM anti-HBc. The same IEM technique used to evaluate the stool samples from the Huitzililla patients was used in studying this outbreak. Numerous 28- to 34-nm viruslike particles similar to those detected for the Huitzililla and Asian patients with ET-NANB hepatitis were identified in one stool. These viruslike particles were aggregated by sera from the Huitzililla and Asian patients.

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Editorial Note: Non-A, non-B hepatitis is caused by at least two distinct viral agents with different modes of spread. The first, post-transfusion non-A, non-B hepatitis, is epidemiologically similar to hepatitis B and is believed to be the most common type of non-A, non-B hepatitis in North America and Europe. The second, ET-NANB hepatitis, is transmitted by the fecal-oral route and has caused large outbreaks in India (*1,2*), Nepal (*3*), Burma (*4*), Pakistan (*5*), and the Soviet Union (*6*). More recently, ET-NANB outbreaks have been reported from Africa (*7,8*). Although person-to-person transmission takes place, most of this epidemic transmission has occurred following heavy rains in populations with inadequate sewage disposal. Mortality rates for pregnant women have been as high as 20% in many of the large outbreaks (*3,8*).

As in other large outbreaks, disease transmission via contaminated water was important in both Mexican outbreaks. It was most apparent in Huitzililla, where the outbreak coincided with seasonal rains, and the shallow, poorly protected wells were easily contaminated with inadequately disposed human feces. The outbreak in Telixtac differed in that, even though it began during the seasonal rains when impure stream water was available, only a

Hepatitis – Continued

minority (20%) of patients used this water source. Thus, the majority of cases in Telixtac may have resulted from person-to-person transmission.

In almost all reported outbreaks of ET-NANB hepatitis, clinical illness is much more common among adults than among children. In most outbreaks, it is likely that children and adults have been exposed at comparable frequencies and that the observed differences in rates of clinical illness are due to differential expression of disease by age similar to that seen for hepatitis A. The occurrence of a large outbreak of hepatitis predominantly among adults in a population known or suspected to be immune to hepatitis A should alert investigators to suspect ET-NANB hepatitis.

At present, there is no readily available serologic test for the ET-NANB agent. The diagnosis must be based on the epidemiologic characteristics of the outbreak, exclusion of hepatitis A and hepatitis B viruses as causes, the identification by IEM of 28- to 34-nm viruslike particles in stools of acutely ill patients, and the aggregation of these particles by sera collected during the acute phase of illness from patients identified in previous outbreaks. A reliable experimental model of ET-NANB hepatitis has been developed recently in marmosets and cynomolgus macaques (*9*). Tests using this model as well as IEM indicate that the viruslike particles recovered from the stools of the Mexican patients are the same as those recovered from Asian and African patients and are responsible for ET-NANB hepatitis (CDC, unpublished data).

Control measures for outbreaks caused by this virus should focus on making the water supply safe. Data from the Huitzililla outbreak suggest that boiling the drinking water had a protective effect. General efforts to improve sanitation and personal hygiene should also be stressed to reduce secondary person-to-person transmission. Theoretically, pooled immune globulin (IG) may have a protective effect if the population from which the IG is derived has had some exposure to this agent in the past. It is unlikely to be protective if the virus has been recently introduced into the region. There was a mass campaign to give all Huitzililla residents IG at the end of August, when the outbreak already appeared to be abating. Six cases of hepatitis occurred among persons who had received IG two or more weeks before the onset of icterus (range 17-45 days before onset). This would suggest that the pooled IG from Mexico was not highly effective in preventing subsequent cases of ET-NANB hepatitis.

It is not possible to determine whether the ET-NANB hepatitis virus was recently introduced into Mexico. The farms in Morelos, where these two outbreaks occurred, cultivate onions for exportation, and owners employ large numbers of Mexican migrant workers. These migrant workers returned to many of the other Mexican states during the summer of 1986 and could have carried the virus with them. For this reason, the Mexican Secretariat of Health has modified the analysis of hepatitis surveillance data to determine attack rates by age group and by state on a monthly basis. If there is an

Hepatitis — Continued

increase in acute hepatitis among older age groups, further investigations will be undertaken in the states involved.

These are the first ET-NANB hepatitis outbreaks reported in the Americas. The occurrence of two such outbreaks in neighboring rural towns with poor sanitary conditions indicates the potential for future transmission of this disease in Mexico and throughout the Americas. In addition, importation of this disease into the United States has been reported to CDC from Pakistan(*5*), India, and Nepal (CDC, unpublished data), and the potential for transmission from persons acquiring disease in other countries should be recognized by physicians and public health officials.

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Epidemiologic Notes and Reports

Fatalities Resulting From Sulfuryl Fluoride Exposure After Home Fumigation — Virginia

On September 25, 1986, an elderly Virginia couple had their home fumigated by a local pest extermination company for the control of wood-boring insects. Two hundred and fifty pounds of sulfuryl fluoride (SF), *Sulfuryl Fluoride – Continued*

a colorless, odorless fumigant gas commonly used for this purpose, was applied in the approximately 80,000-cubic-foot home that day. Before fumigation, the house was vacated, tightly sealed, and externally covered with a tarpaulin to maintain high levels of the gas inside. During fumigation, electric fans were used to circulate the pesticide. Entry into the house was prohibited until approved by the exterminators, and a security guard watched the house from 2 p.m. on September 25 until 7 a.m. on September 26.

At 9 a.m. on September 26, the exterminators removed the tarpaulin and opened the doors and windows to ventilate the house. Afterward, they ran electric fans for 2 1/2 hours to facilitate air circulation. Reentry was approved at 2 p.m., and reports suggest that the couple returned home between that time and 5 p.m., approximately 5 to 8 hours after the ventilation procedures began. The couple left their home to attend a football game at 7 p.m. and returned for the night at approximately 10 or 11 p.m.

On September 27, within 24 hours of their return, the wife experienced weakness, nausea, and repeated vomiting, and her husband complained of dyspnea and restlessness. By the morning of September 28, the husband had developed severe dyspnea and cough. At 7:15 a.m., he experienced a generalized seizure followed by cardiopulmonary arrest. He was transported to a local emergency room, but resuscitative measures were unsuccessful. Death was presumed to be caused by an acute myocardial infarction, and inhalation of a toxic agent was not suspected.

On October 1, the widow, who was complaining of severe weakness, dyspnea, intermittent chills, and anorexia, consulted her family physician. She had not left her home in 3 days and was unable to walk into the physician's office. She was admitted to the hospital, where a chest x-ray revealed severe hypoxemia and diffuse pulmonary infiltrates. On October 2, ventricular fibrillation occurred, and she died at approximately 11 p.m. Because both deaths occurred within a short period of time and the wife's illness was compatible with toxic gas inhalation, these deaths were then thought to be related to the recent home fumigation.

Autopsy reports provided by the Office of the Chief Medical Examiner revealed that both decedents died of acute pulmonary edema from exposure to a toxic agent. Toxicologic analysis of blood and other tissues could not be performed on the husband, but analysis of serum obtained from the wife on October 1 (6 days after fumigation) revealed a plasma fluoride level of 0.5 mg/l. No fluoride was detected (at the 1.0 mg/kg concentration) in other tissues, including those from the kidneys, liver, and lungs. No other toxic agents were detected. Although the couple became ill at similar times, the differences in time from exposure till death suggest that their levels of exposure to SF may have differed. Unfortunately, the details of their activities upon reoccupying their home are not known.

On October 6, the district manager of the extermination company notified the Virginia Department of Agriculture and Consumer Services of the deaths.

Sulfuryl Fluoride — Continued

Investigation verified that the cylinders of pesticide contained SF and had been manufactured prior to June 28, 1986. The amount used (250 pounds) was determined to be appropriate, based on the cubic footage of the house, the air temperature, and the relative humidity.

Although the exterminators removed the tarpaulin, opened the windows and doors, and used fans to aerate the home, they failed to measure the air concentration of SF inside the home. This step is necessary to determine the appropriate time for reoccupancy. Air samples taken during the investigationby state officials on October 8 revealed no detectable levels of SF, but levels of this gas would have been expected to have dissipated by that time.

Neither of the two workers who removed the tarpaulin and ventilated the house was licensed, but their supervisor, who had extensive experience with

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

Disease	36th Week Ending			Cumulative, 36th Week Ending		
	Sept. 12, 1987	Sept. 6, 1986	Median 1982-1986	Sept. 12, 1987	Sept. 6, 1986	Median 1982-1986
Acquired Immunodeficiency Syndrome (AIDS)	89	147	N	12,759	8,511	N
Aseptic meningitis	439	351	351	7,222	6,205	5,416
Encephalitis: Primary (arthropod-borne & unspec)	36	44	44	836	728	768
Post-infectious	4	1	1	81	80	80
Gonorrhea: Civilian	13,590	14,022	17,219	536,772	601,531	603,153
Military	248	243	405	11,552	11,423	14,899
Hepatitis: Type A	366	436	436	16,807	15,145	15,040
Type B	428	444	479	17,716	17,935	17,466
Non A, Non B	32	65	N	2,103	2,510	N
Unspecified	54	63	108	2,158	3,123	3,914
Legionellosis	7	19	N	598	475	N
Leprosy	4	3	3	135	185	172
Malaria	25	16	29	610	740	711
Measles: Total*	10	38	29	3,262	5,354	2,306
Indigenous	9	36	N	2,868	5,081	N
Imported	1	2	N	394	267	N
Meningococcal infections: Total	37	30	30	2,120	1,838	2,011
Civilian	37	30	30	2,119	1,836	1,996
Military	-	-	-	1	2	6
Mumps	34	121	24	10,194	3,477	2,421
Pertussis	125	78	107	1,675	2,146	1,632
Rubella (German measles)	7	10	12	288	426	547
Syphilis (Primary & Secondary): Civilian	801	363	438	24,198	17,815	19,147
Military	-	1	2	104	122	227
Toxic Shock syndrome	1	5	N	224	250	N
Tuberculosis	350	383	383	14,423	14,908	14,908
Tularemia	3	4	5	141	101	171
Typhoid Fever	2	4	11	209	204	241
Typhus fever, tick-borne (RMSF)	18	14	27	483	556	662
Rabies, animal	63	122	122	3,289	3,900	3,900

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1987		Cum. 1987
Anthrax (N.C. 1)	1	Leptospirosis (Hawaii 1)	16
Botulism: Foodborne	9	Plague	7
Infant (Ohio 1, Utah 1, Hawaii 1)	40	Poliomyelitis, Paralytic	-
Other	-	Psittacosis (Calif. 2)	63
Brucellosis (Ky. 1)	79	Rabies, human	-
Cholera	4	Tetanus (Calif. 1)	29
Congenital rubella syndrome (Calif. 1)	5	Trichinosis (Calif. 1)	31
Congenital syphilis, ages < 1 year	-	Typhus fever, flea-borne (endemic, murine)	23
Diphtheria	1		

*One of the 10 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 September 12, 1987 and September 6, 1986 (36th 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. 1987	1987	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1986	1987	1987	1987	1987	1987	Cum. 1987
UNITED STATES	12,759	439	836	81	536,772	601,531	366	428	32	54	7	135
NEW ENGLAND	520	24	33	2	16,263	14,529	21	21	1	2	-	11
Maine	16	2	2	-	489	623	1	-	-	1	-	-
N.H.	13	3	2	-	284	384	-	-	1	-	-	2
Vt.	4	2	5	-	142	174	-	1	-	-	-	-
Mass.	329	7	15	1	5,932	6,091	14	11	-	1	-	8
R.I.	41	8	3	1	1,462	1,188	3	-	-	-	-	-
Conn.	117	2	6	-	7,954	6,069	3	9	-	-	-	1
MID. ATLANTIC	3,770	81	100	6	85,507	100,563	17	81	3	14	-	6
Upstate N.Y.	467	-	38	3	11,637	11,968	1	4	-	-	-	-
N.Y. City	2,256	22	7	-	44,429	57,447	2	44	-	13	-	6
N.J.	666	46	7	-	11,272	13,414	8	6	2	1	-	-
Pa.	381	13	48	3	18,169	17,734	6	27	1	-	-	-
E.N. CENTRAL	834	70	255	12	80,506	83,452	19	42	2	2	2	6
Ohio	154	27	111	5	17,987	19,702	8	16	2	-	2	2
Ind.	71	-	34	-	6,390	8,794	-	-	-	-	-	-
Ill.	409	2	25	7	24,651	21,463	3	15	-	1	-	1
Mich.	132	41	60	-	24,993	24,870	8	11	-	1	-	2
Wis.	68	-	25	-	6,485	8,623	-	-	-	-	-	1
W.N. CENTRAL	279	38	45	-	21,704	25,590	22	16	5	2	-	-
Minn.	75	6	28	-	3,365	3,730	-	-	-	-	-	-
Iowa	19	6	7	-	2,041	2,638	1	3	2	-	-	-
Mo.	135	16	-	-	11,439	12,726	12	10	2	2	-	-
N. Dak.	1	-	-	-	194	232	-	-	-	-	-	-
S. Dak.	2	3	-	-	396	532	1	-	-	-	-	-
Nebr.	16	-	8	-	1,369	1,986	-	1	-	-	-	-
Kans.	31	7	2	-	2,900	3,746	8	2	1	-	-	-
S. ATLANTIC	2,009	70	104	27	140,409	156,232	19	82	6	5	4	5
Del.	15	4	3	1	2,311	2,534	1	1	-	-	-	-
Md.	243	13	16	5	15,768	18,482	2	9	1	-	-	2
D.C.	248	1	-	-	9,312	11,561	-	1	-	-	-	-
Va.	152	16	24	2	10,311	12,615	6	3	-	-	-	-
W. Va.	16	2	29	-	1,036	1,544	-	2	-	-	-	-
N.C.	107	7	17	-	20,360	24,316	1	6	1	-	1	-
S.C.	52	-	-	-	11,559	13,593	1	14	-	-	1	1
Ga.	292	13	1	-	25,044	26,292	4	28	-	-	1	-
Fla.	884	14	14	19	44,708	45,295	4	18	4	5	1	2
E.S. CENTRAL	154	51	46	7	40,578	48,656	16	32	2	2	-	-
Ky.	24	10	21	1	4,091	5,358	13	2	-	1	-	-
Tenn.	25	23	10	-	14,147	18,767	1	14	-	-	-	-
Ala.	86	15	15	1	12,976	13,919	1	11	1	-	-	-
Miss.	19	3	-	5	9,364	10,612	1	5	1	1	-	-
W.S. CENTRAL	1,219	30	101	4	60,343	70,942	33	40	6	13	-	4
Ark.	25	-	-	2	6,922	6,637	1	-	-	-	-	-
La.	161	1	19	-	10,930	12,674	4	9	1	-	-	-
Okla.	72	3	16	1	6,732	8,097	2	3	2	-	-	-
Tex.	961	26	66	1	35,759	43,534	26	28	3	13	-	4
MOUNTAIN	338	26	33	4	14,104	17,655	59	24	3	6	-	2
Mont.	2	-	-	-	394	493	-	-	-	-	-	-
Idaho	4	-	-	-	510	558	11	2	-	1	-	1
Wyo.	3	-	1	-	301	386	-	-	-	-	-	-
Colo.	146	13	10	-	3,031	4,630	6	1	-	4	-	-
N. Mex.	27	-	4	-	1,553	1,753	4	4	-	1	-	-
Ariz.	100	11	14	1	4,849	5,757	34	12	3	-	-	-
Utah	20	1	-	3	442	757	4	1	-	-	-	-
Nev.	36	1	4	-	3,024	3,321	-	4	-	-	-	1
PACIFIC	3,636	49	119	19	77,358	83,912	160	90	4	8	1	101
Wash.	160	-	10	4	5,729	6,487	12	4	-	1	-	4
Oreg.	87	-	-	-	2,836	3,496	9	9	-	-	-	-
Calif.	3,315	46	104	15	67,014	71,128	136	72	4	7	1	77
Alaska	12	1	2	-	1,184	1,888	2	2	-	-	-	1
Hawaii	62	2	3	-	595	913	1	3	-	-	-	19
Guam	-	-	-	-	151	132	-	-	-	-	-	-
P.R.	84	-	1	1	1,459	1,599	-	4	-	1	-	5
V.I.	-	-	-	-	188	194	-	-	-	-	-	-
Pac. Trust Terr.	-	-	-	-	287	326	-	-	-	-	-	44
Amer. Samoa	-	-	-	-	59	31	-	-	-	-	-	-

N: Not notifiable U: Unavailable

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending September 12, 1987 and September 6, 1986 (36th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986
UNITED STATES	610	9	2,868	1	394	5,354	2,120	34	10194	125	1,675	2,146	7	288	426
NEW ENGLAND	39	1	105	-	150	85	179	1	36	14	109	119	-	1	9
Maine	-	-	3	-	-	10	10	-	-	9	26	2	-	1	-
N.H.	2	-	52	-	101	42	16	-	9	5	27	60	-	-	1
Vt.	-	-	11	-	15	-	14	-	3	-	4	3	-	-	1
Mass.	14	-	22	-	27	28	87	-	8	-	37	28	-	-	4
R.I.	7	-	1	-	1	2	14	-	2	-	1	5	-	-	2
Conn.	16	1	16	-	6	3	38	1	14	-	14	21	-	-	1
MID. ATLANTIC	72	2	519	1	57	1,662	260	-	178	7	203	146	-	11	31
Upstate N.Y.	27	-	26	-	14	87	89	-	84	-	119	94	-	9	23
N.Y. City	5	2	440	1 †	19	646	20	-	10	4	4	3	-	1	5
N.J.	17	-	32	-	7	905	48	-	42	-	10	14	-	1	3
Pa.	23	-	21	-	17	24	103	-	42	3	70	35	-	-	-
E.N. CENTRAL	42	6	288	-	24	1,028	314	12	5,952	2	168	294	-	33	69
Ohio	12	-	1	-	4	10	104	1	84	2	55	117	-	-	1
Ind.	4	-	-	-	-	17	34	-	915	-	13	22	-	-	-
Ill.	7	6	122	-	18	652	78	4	2,478	-	14	35	-	25	59
Mich.	15	-	29	-	-	58	81	7	881	-	41	26	-	8	8
Wis.	4	-	136	-	2	286	17	-	1,594	-	45	94	-	-	1
W.N. CENTRAL	19	-	208	-	22	339	91	-	1,323	-	91	183	-	1	10
Minn.	7	-	19	-	20	49	26	-	759	-	13	41	-	-	-
Iowa	4	-	-	-	-	134	3	-	397	-	31	18	-	1	1
Mo.	4	-	188	-	1	31	26	-	22	-	24	12	-	-	1
N. Dak.	-	-	1	-	-	25	1	-	6	-	6	5	-	-	1
S. Dak.	-	-	-	-	-	-	2	-	89	-	3	14	-	-	-
Nebr.	3	-	-	-	-	1	5	-	3	-	1	7	-	-	-
Kans.	1	-	-	-	1	99	28	-	47	-	13	86	-	-	7
S. ATLANTIC	101	-	118	-	12	635	345	3	235	9	253	652	-	14	4
Del.	1	-	32	-	-	1	5	-	-	-	5	226	-	2	-
Md.	24	-	3	-	2	35	32	1	23	-	11	157	-	2	-
D.C.	15	-	-	-	1	2	7	-	1	-	-	-	-	-	-
Va.	16	-	1	-	-	60	57	1	69	3	47	33	-	1	-
W. Va.	2	-	-	-	-	2	2	-	31	1	46	23	-	-	-
N.C.	9	-	2	-	3	3	45	1	17	5	103	58	-	1	-
S.C.	4	-	2	-	-	301	34	-	12	-	-	13	-	-	-
Ga.	4	-	-	-	1	93	67	-	40	-	23	103	-	1	-
Fla.	26	-	78	-	5	138	96	-	42	-	18	39	-	7	4
E.S. CENTRAL	12	-	2	-	3	67	104	3	1,224	-	32	45	-	3	4
Ky.	1	-	-	-	-	6	20	-	212	-	1	5	-	2	4
Tenn.	1	-	-	-	-	56	41	1	953	-	9	17	-	1	-
Ala.	5	-	-	-	3	2	35	2	59	-	17	23	-	-	-
Miss.	5	-	2	-	-	3	8	N	N	-	5	-	-	-	-
W.S. CENTRAL	36	-	405	-	4	638	149	4	727	57	215	171	-	11	57
Ark.	1	-	-	-	-	283	19	-	281	-	10	11	-	2	-
La.	-	-	-	-	-	4	17	2	217	-	39	11	-	-	-
Okla.	4	-	2	-	1	39	18	N	N	6	115	95	-	5	-
Tex.	31	-	403	-	3	312	95	2	229	51	51	54	-	4	57
MOUNTAIN	28	-	477	-	19	323	70	2	192	10	139	207	-	24	23
Mont.	-	-	127	-	1	8	3	-	4	-	6	13	-	8	2
Idaho	2	-	-	-	-	1	5	-	5	2	39	33	-	1	-
Wyo.	1	-	-	-	2	-	-	-	-	-	5	4	-	1	1
Colo.	7	-	5	-	4	7	20	-	28	1	49	57	-	-	1
N. Mex.	2	-	313	-	9	37	6	N	N	1	9	20	-	-	-
Ariz.	13	-	30	-	1	258	23	2	143	6	29	48	-	4	2
Utah	1	-	-	-	1	11	9	-	9	-	2	29	-	10	14
Nev.	2	-	2	-	1	1	4	-	3	-	-	3	-	-	3
PACIFIC	261	-	746	-	103	577	608	9	327	26	465	329	7	190	219
Wash.	17	-	34	-	7	155	70	1	45	2	67	99	1	2	14
Oreg.	5	-	2	-	75	9	26	N	N	-	56	10	-	2	1
Calif.	235	-	710	-	17	391	499	8	261	6	161	211	4	121	199
Alaska	3	-	-	-	-	-	4	-	7	-	10	2	-	2	-
Hawaii	1	-	-	-	4	22	9	-	14	18	171	7	2	63	5
Guam	-	-	2	-	-	5	4	-	5	-	-	-	-	1	3
P.R.	1	13	741	-	-	33	5	1	9	-	16	13	-	2	60
V.I.	-	-	-	-	-	-	-	1	12	-	-	-	-	-	-
Pac. Trust Terr.	-	-	1	-	-	-	1	-	5	-	1	-	-	1	2
Amer. Samoa	-	-	-	-	-	2	-	-	3	-	-	-	-	-	1

*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 September 12, 1987 and September 6, 1986 (36th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1987
UNITED STATES	24,198	17,815	1	14,423	14,908	141	209	483	3,289
NEW ENGLAND	417	329	-	443	488	1	22	7	6
Maine	1	15	-	21	33	-	1	-	2
N.H.	3	10	-	16	20	-	-	-	-
Vt.	2	8	-	9	13	-	1	-	-
Mass.	195	176	-	249	255	1	12	4	-
R.I.	8	18	-	35	40	-	3	-	1
Conn.	208	102	-	113	127	-	5	3	3
MID. ATLANTIC	4,507	2,570	-	2,459	3,022	-	21	12	277
Upstate N.Y.	159	130	-	363	446	-	8	7	43
N.Y. City	3,282	1,447	-	1,157	1,559	-	1	-	-
N.J.	476	461	-	459	517	-	12	1	13
Pa.	590	532	-	480	500	-	-	4	221
E.N. CENTRAL	650	688	-	1,686	1,773	3	25	48	122
Ohio	78	94	-	316	317	1	6	34	10
Ind.	44	86	-	145	191	-	4	-	13
Ill.	348	351	-	744	765	-	8	6	36
Mich.	129	125	-	406	414	-	4	5	22
Wis.	51	32	-	75	86	2	3	3	41
W.N. CENTRAL	137	156	-	435	432	49	9	49	733
Minn.	14	27	-	89	107	-	4	-	177
Iowa	20	6	-	30	34	4	2	1	206
Mo.	66	81	-	240	214	31	3	18	44
N. Dak.	-	5	-	5	6	1	-	-	89
S. Dak.	10	4	-	22	18	7	-	1	166
Nebr.	7	12	-	16	8	2	-	3	16
Kans.	20	21	-	33	45	4	-	26	35
S. ATLANTIC	8,254	5,381	-	3,132	2,838	5	20	174	893
Del.	54	36	-	31	33	1	-	2	-
Md.	420	307	-	288	218	-	3	37	282
D.C.	247	211	-	105	94	-	1	-	35
Va.	207	260	-	312	231	2	3	15	261
W. Va.	6	18	-	77	85	-	1	5	44
N.C.	464	347	-	334	367	2	2	58	13
S.C.	521	464	-	331	378	-	-	32	40
Ga.	1,166	1,043	-	542	437	-	-	24	148
Fla.	5,169	2,695	-	1,112	995	-	10	1	70
E.S. CENTRAL	1,326	1,187	1	1,166	1,298	5	2	77	227
Ky.	13	54	-	292	307	1	1	9	113
Tenn.	530	421	-	285	391	1	1	48	57
Ala.	342	382	1	361	404	-	-	16	57
Miss.	441	330	-	228	196	3	-	4	-
W.S. CENTRAL	2,922	3,561	-	1,707	1,908	52	11	102	456
Ark.	187	168	-	200	258	22	1	11	92
La.	516	605	-	188	320	3	-	-	11
Okla.	105	95	-	165	184	24	2	79	27
Tex.	2,114	2,693	-	1,154	1,146	3	8	12	326
MOUNTAIN	476	416	-	335	360	15	12	12	276
Mont.	8	6	-	10	17	2	-	10	127
Idaho	5	10	-	17	16	1	-	-	6
Wyo.	2	1	-	-	-	-	-	1	58
Colo.	78	100	-	40	41	4	-	-	6
N. Mex.	40	51	-	70	69	1	9	-	2
Ariz.	230	167	-	162	167	3	3	-	59
Utah	21	11	-	16	28	2	-	1	7
Nev.	92	70	-	20	22	2	-	-	11
PACIFIC	5,509	3,527	-	3,060	2,789	11	87	2	299
Wash.	77	111	-	179	134	4	7	-	-
Oreg.	203	75	-	80	97	4	1	-	-
Calif.	5,217	3,316	-	2,625	2,391	2	73	2	296
Alaska	3	-	-	44	37	1	-	-	3
Hawaii	9	25	-	132	130	-	6	-	-
Guam	2	1	-	25	34	-	-	-	-
P.R.	648	605	-	208	231	-	-	-	48
V.I.	4	1	-	2	1	-	-	-	-
Pac. Trust Terr.	126	196	-	122	50	-	16	-	-
Amer. Samoa	2	-	-	-	5	-	1	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending September 12, 1987 (36th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	631	439	122	41	13	16	47
Boston, Mass.	163	100	37	16	5	5	19
Bridgeport, Conn.	48	36	7	2	1	2	5
Cambridge, Mass.	32	26	6	-	-	-	3
Fall River, Mass.	23	17	5	1	-	-	-
Hartford, Conn.§	58	38	14	4	1	1	2
Lowell, Mass.	29	21	6	2	-	-	3
Lynn, Mass.	12	9	3	-	-	-	-
New Bedford, Mass.	15	15	-	-	-	-	-
New Haven, Conn.	64	44	11	5	2	2	5
Providence, R.I.	54	41	8	3	-	2	1
Somerville, Mass.	8	6	-	1	1	-	-
Springfield, Mass.	52	38	9	2	1	2	6
Waterbury, Conn.	18	11	4	1	2	-	-
Worcester, Mass.	55	37	12	4	-	2	3
MID. ATLANTIC	2,587	1,644	531	306	54	52	112
Albany, N.Y.	54	38	12	3	-	1	1
Allentown, Pa.	20	15	3	1	1	-	-
Buffalo, N.Y.	120	82	28	9	1	-	5
Camden, N.J.	31	11	9	7	2	2	1
Elizabeth, N.J.	26	19	4	2	-	1	2
Erie, Pa.†	42	30	7	2	1	2	4
Jersey City, N.J.	49	28	10	6	1	4	1
N.Y. City, N.Y.	1,389	857	279	207	27	19	48
Newark, N.J.	86	40	16	18	8	4	2
Paterson, N.J.	31	15	9	5	-	2	1
Philadelphia, Pa.	298	199	65	20	7	7	13
Pittsburgh, Pa.†	74	45	24	2	1	2	6
Reading, Pa.	28	22	4	2	-	-	3
Rochester, N.Y.	124	86	19	12	3	4	12
Schenectady, N.Y.	27	19	4	4	-	-	3
Scranton, Pa.†	25	21	3	1	-	-	-
Syracuse, N.Y.	80	58	15	2	2	3	3
Trenton, N.J.	32	19	10	3	-	-	-
Utica, N.Y.	22	18	3	-	-	1	3
Yonkers, N.Y.	29	22	7	-	-	-	4
E.N. CENTRAL	2,038	1,326	448	139	60	65	94
Akron, Ohio	21	14	5	-	-	2	-
Canton, Ohio	32	20	10	2	-	-	3
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	92	63	21	6	2	-	8
Cleveland, Ohio	133	90	25	12	4	2	-
Columbus, Ohio	129	77	34	14	2	2	6
Dayton, Ohio	96	56	31	2	3	4	4
Detroit, Mich.	203	113	48	21	14	7	6
Evansville, Ind.	28	20	6	-	-	2	2
Fort Wayne, Ind.	51	32	12	3	4	-	2
Gary, Ind.	15	11	3	1	-	-	-
Grand Rapids, Mich.	69	52	10	3	-	4	6
Indianapolis, Ind.	150	95	28	10	9	8	7
Madison, Wis.	38	26	7	2	2	1	2
Milwaukee, Wis.	116	89	21	3	2	1	7
Peoria, Ill.	51	27	17	4	1	2	6
Rockford, Ill.	50	42	6	2	-	-	3
South Bend, Ind.	63	47	14	-	-	2	8
Toledo, Ohio	68	42	10	7	6	3	7
Youngstown, Ohio	69	48	15	2	1	3	1
W.N. CENTRAL	645	418	146	44	17	20	43
Des Moines, Iowa	64	45	15	3	1	-	2
Duluth, Minn.	19	12	3	1	-	3	3
Kansas City, Kans.	28	16	8	1	2	1	1
Kansas City, Mo.	109	73	24	4	3	5	10
Lincoln, Nebr.	15	7	5	3	-	-	-
Minneapolis, Minn.	96	64	22	8	1	1	10
Omaha, Nebr.	67	40	18	4	3	2	5
St. Louis, Mo.	129	82	25	13	3	6	4
St. Paul, Minn.	52	38	9	3	2	-	2
Wichita, Kans.	66	41	17	4	2	2	6

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-84	25-44	1-24	<1	Total
S. ATLANTIC	1,072	634	218	146	46	27	43
Atlanta, Ga.	125	83	24	10	7	1	6
Baltimore, Md.	202	109	48	34	4	7	4
Charlotte, N.C.	99	62	22	8	5	2	2
Jacksonville, Fla.	86	62	13	8	-	3	5
Miami, Fla.	63	27	15	15	4	2	2
Norfolk, Va.	52	30	12	4	4	2	2
Richmond, Va.	82	54	16	3	4	5	7
Savannah, Ga.	37	23	10	3	-	1	1
St. Petersburg, Fla.	60	50	7	2	1	-	1
Tampa, Fla.	56	31	15	6	2	1	6
Washington, D.C.	191	89	34	51	14	3	6
Wilmington, Del.	19	14	2	2	1	-	1
E.S. CENTRAL	656	454	119	48	16	19	38
Birmingham, Ala.	85	54	19	3	5	4	-
Chattanooga, Tenn.	57	38	12	5	1	1	2
Knoxville, Tenn.	88	64	15	8	-	1	7
Louisville, Ky.	104	77	16	4	4	3	1
Memphis, Tenn.	144	101	29	8	1	5	16
Mobile, Ala.	64	48	9	6	1	-	6
Montgomery, Ala.	39	26	4	5	1	3	2
Nashville, Tenn.	75	46	15	9	3	2	4
W.S. CENTRAL	1,058	613	254	114	41	36	38
Austin, Tex.	47	23	9	8	6	1	3
Baton Rouge, La.	36	26	6	3	1	-	1
Corpus Christi, Tex.§	42	28	11	2	-	1	1
Dallas, Tex.	179	87	49	27	8	8	7
El Paso, Tex.	22	13	6	1	-	2	-
Fort Worth, Tex	72	43	19	6	2	2	2
Houston, Tex.§	308	176	74	34	13	11	7
Little Rock, Ark.	47	32	13	1	1	-	5
New Orleans, La.	79	42	21	11	2	3	-
San Antonio, Tex.	112	75	19	7	7	4	5
Shreveport, La.	37	24	8	3	-	2	5
Tulsa, Okla.	77	44	19	11	1	2	2
MOUNTAIN	548	343	98	52	33	22	28
Albuquerque, N. Mex.	83	46	16	10	8	3	6
Colo. Springs, Colo.	26	16	2	4	1	3	6
Denver, Colo.	96	69	13	9	-	5	4
Las Vegas, Nev.	82	52	16	3	8	3	3
Ogden, Utah	21	12	7	-	2	-	3
Phoenix, Ariz.	94	54	22	12	2	4	2
Pueblo, Colo.	14	12	1	-	1	-	-
Salt Lake City, Utah	44	26	8	4	3	3	-
Tucson, Ariz.	88	56	13	10	8	1	4
PACIFIC	1,704	1,082	326	171	63	57	65
Berkeley, Calif.	15	9	5	1	-	-	-
Fresno, Calif.	94	50	21	13	5	5	3
Glendale, Calif.§	23	19	3	1	-	-	1
Honolulu, Hawaii	60	40	10	4	3	3	9
Long Beach, Calif.	96	66	16	10	3	1	2
Los Angeles Calif.§	510	324	104	51	21	6	11
Oakland, Calif.§	62	39	12	7	3	1	4
Pasadena, Calif.	28	18	7	2	1	-	4
Portland, Oreg.	100	70	19	7	2	2	4
Sacramento, Calif.	140	90	23	12	7	8	4
San Diego, Calif.	106	57	25	14	4	5	4
San Francisco, Calif.	147	93	20	23	1	10	3
San Jose, Calif.	133	88	30	7	2	6	11
Seattle, Wash.	103	61	17	13	6	6	2
Spokane, Wash.	51	34	9	3	2	3	3
Tacoma, Wash.	36	24	5	3	3	1	-
TOTAL	10,939††	6,953	2,262	1,061	343	314	508

*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.

Sulfuryl Fluoride — Continued

SF, was certified. The presence of a certified applicator was not required by the product labels on the cylinders used during this fumigation, and none was on hand at the time.

Reported by: JG Nuckolls, MD, Galax; DC Smith, MD, Mount Rogers Health Dist, Marion; WE Walls, Virginia Dept of Agriculture and Consumer Svcs; DW Oxley, MD, Office of the Chief Medical Examiner, Roanoke; RL Hackler, RK Tripathi, PhD, CW Armstrong, MD, GB Miller, MD, State Epidemiologist, Virginia Dept of Health. Div of Environmental Hazards and Health Effects, Center for Environmental Health and Injury Control; Div of Field Svcs, Epidemiology Program Office, CDC.

Editorial Note: SF (chemical formula F_2O_2S) was first introduced in 1957 as an insecticide and has been widely used to exterminate wood-boring insects in buildings. It is applied by fumigation techniques that require the building to be tightly sealed to allow a high concentration to penetrate the wood. In 1986, approximately 200 to 500 homes in Virginia were fumigated with SF (Dow Chemical Company, unpublished data). It is, however, more widely used in other areas of the United States, such as Florida and California.

Background plasma fluoride levels for humans have been reported to be approximately 0.01 mg/l. While peak concentrations of 0.06 to 0.4 mg/l have been noted 30 minutes after ingestion of 10 mg of fluoride, these levels have been noted to decrease to 0.2 mg/l within 2-9 hours (*1*). Thus, the concentration of 0.5 mg/l found in serum obtained from the wife 6 days after fumigation suggests that she had experienced acute exposure to an elevated concentration of fluoride.

In short-term toxicologic experiments, inhalation of 1,000 parts per million (ppm) of SF for 3 hours or 15,000 ppm for 6 minutes was fatal to less than 5% of experimental animals (*2*). However, these studies also indicate that higher concentrations of SF cause respiratory irritation and central nervous system depression, which may be followed by excitation, convulsions, and respiratory arrest (*2,3*). Animals exposed to low but unspecified doses of SF first had parasympathetic stimulation with vomiting, diarrhea, lacrimation, salivation, and abdominal colic (*3*). This stage was followed by cardiovascular collapse and pulmonary edema. Similar observations were noted in the two cases reported here.

The scientific literature reports at least four deaths from exposure to SF since its wide usage began 10 to 15 years ago (*3-5*). However, these two fatalities in Virginia are the first in which the residents had not reentered the structure under unusual or prohibited circumstances. In this situation, there had not been appropriate air monitoring during aeration and before clearance for reoccupancy was given. These precautions are clearly required by the product label.

The product labels on all cylinders manufactured since June 28, 1986, require that two persons trained in the use of SF be present at all times during fumigant introduction, testing, and aeration procedures. After fumigation, the house is to be aerated until the level of SF is $\leq$5 ppm, as

Sulfuryl Fluoride — Continued

measured by a Miran* gas analyzer. Measurements should be taken before reoccupancy because the kinetics of SF dissipation depends on many variables including the amount of fumigant applied, the quality of the tarpaulin, the ambient temperature, and the wind speed. No one should enter the house without a self-contained breathing apparatus if the level of SF is >5 ppm. The Occupational Safety and Health Administration's current permissible exposure limit and the American Conference of Governmental Industrial Hygienists' (ACGIH) threshold limit value for SF are 5 ppm (*6*). The ACGIH short-term exposure limit is 10 ppm. The level considered immediately dangerous to life and health is 1,000 ppm, and persons exposed at this level must use a supplied-air respirator with a full facepiece, helmet, or hood.

The difference in time of death for the couple was striking, but data are not sufficient for interpretation. The only known host factor that may account for this difference is age, since neither the husband nor wife had a prior history of cardiopulmonary disease. The husband was 8 years older than the wife, but it is doubtful that this small age difference could account for the large time difference between their deaths.

Persons who develop illness that may be related to SF exposure require consultation by a physician. Health-care workers should be aware that exposure to highly toxic substances such as SF may occur without warning or detection and may involve persons other than the individual patient. The initial symptoms of illness from SF exposure can be nonspecific and may resemble other common illnesses, even when the dose has been in the lethal range. Early clinical recognition of illness, timely investigation of the source, and appropriate environmental intervention may help prevent fatalities from this type of exposure.

Preventing life-threatening exposure to SF depends on the proper use of this pesticide. According to package labeling, this restricted-use pesticide is "for sale to and use only by certified applicators or persons under their direct supervision." The label also states that the product is only for those uses for which the applicator is certified. Certified applicators are cautioned to use SF in accordance with the label instructions, and consumers are alerted to be aware of the precautions that should be taken when their homes are exterminated.

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*Use of trade names is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services or the Public Health Service.

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Epidemiologic Notes and Reports

Ethylene Glycol Intoxication Due to Contamination of Water Systems

Within the past 2 years, two instances of ethylene glycol intoxication due to contamination of water systems have been reported to CDC. The first occurred in New York in 1985; the second, in North Dakota in 1987. Details of the two investigations follow.

New York. In March 1985, a 52-year-old hospitalized woman died 1 day after being exposed to ethylene glycol during a session of hemodialysis for chronic renal failure. Review of the events preceding the accident revealed that the hospital's potable water system, which was the source of water used to prepare dialysis fluid, had been inadvertently contaminated when the air-conditioning system was flushed with a commercial solution that is 95% ethylene glycol and contains a marker dye.

Contrary to the municipal building code, there was a direct line connection between the potable water system and the chilled water circuit of the air-conditioning system. This connecting line was open for flushing of the chilled water circuit when the chilled water pump was activated. A check valve in the line failed to prevent backflow from the pressurized circuit into the potable water system. Despite its being detected elsewhere in the hospital, contamination of the potable water went unrecognized in the dialysis unit.

The patient was noted to be somnolent after her final dialysis session, but ethylene glycol intoxication was not suspected until coma, metabolic acidosis, and irreversible shock developed 12 hours later. One other patient had been dialyzed earlier on the same day as the injured patient but showed no evidence of ethylene glycol exposure. One hospital worker had taken a sip of contaminated water but had not swallowed it because of its taste and obvious discoloration. No other exposures were reported.

North Dakota. On the evening of April 12, 1987, two children, 4 and 7 years of age, were admitted to a rural North Dakota hospital because of the acute

Ethylene Glycol — Continued

onset of marked somnolence, vomiting, and ataxia. After developing hematuria, the children were transferred to the pediatric intensive care unit of a Fargo hospital. They were given fluids intravenously and recovered fully within 2 days. Urinalysis for each child revealed calcium oxalate crystals, and toxicologic studies of their urine samples revealed the presence of ethylene glycol.

On the day they became ill, both children had been at a picnic attended by approximately 400 persons at a firehall in rural North Dakota. Three hundred and fifty-four (91%) of the 391 attendees identified were interviewed by telephone about symptoms related to ethylene glycol toxicity and the foods and beverages they consumed at the picnic. Those persons who reported marked fatigue* or ataxia on the evening of the picnic and who had not drunk beer were considered as having met the case definition of acute illness. Reports for children under 12 years of age were made by an accompanying adult.

Twenty-nine (8%) of the 354 persons interviewed met the case definition. Nineteen (66%) of the cases were among children younger than 10 years of age. The symptoms most frequently reported were excessive fatigue (90%), excessive sleepiness (76%), unsteadiness when walking (62%), and dizziness (55%). Only the two children mentioned above were hospitalized, and there were no fatalities. One food item, a noncarbonated soft drink, was strongly associated with illness (relative risk, 31.0). Among those who consumed the soft drink, 18% (28/159) became ill, while among nonconsumers, 0.6% (1/176) became ill.

There was a marked dose effect among children under 10 years of age. No cases occurred among those who did not consume the beverage; two cases (10%) occurred among those consuming ≤1/2 cup; five cases (42%), among those consuming >1/2 to 1 1/2 cups; and 12 cases (80%), among those consuming >1 1/2 cups.

The water used to prepare the powdered beverage had been drawn from the spigot nearest the firehall's heating system. The heating system used a mixture of water and antifreeze and was cross-connected to the potable water supply. The cross-connection was regulated by a single valve. It was uncertain whether the valve had been closed during preparation of the beverage. All other food items and beverages were prepared at a kitchen sink approximately 30 feet from the spigot nearest the heating system. A water sample taken at the spigot the evening of the picnic had an ethylene glycol concentration of 9%.

Because the firehall was not licensed as a public dining facility, it had not been inspected by food service sanitarians. Recommendations were made to redesign the heating system to separate it permanently from the potable water supply.

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*Felt or acted more tired than usual and slept ≥2 hours before 10 p.m. that evening.

Ethylene Glycol — Continued

Reported by: S Schultz, MD, New York City Dept of Health. M Kinde, MPH, D Johnson, MS, S Holmes, JL Pearson, DrPH, State Epidemiologist, North Dakota Dept of Health. Div of Nutrition, Center for Health Promotion and Education; Div of Field Svcs, Epidemiology Program Office, CDC.

Editorial Note: Ethylene glycol is a solvent with a sweetish, acrid taste, best known for its use in antifreeze solution. Because of its thermal properties, an ethylene glycol and water solution is sometimes used in the heating and cooling systems of buildings. Acute poisoning from ingestion can result in central nervous system depression, vomiting, hypotension, respiratory failure, coma, convulsions, and renal damage. The fatal dose for ingestion by adults is approximately 100 g (*1*).

It is estimated that as many as 60 deaths occur annually in the United States from ethylene glycol poisoning; most of these are due to renal failure (*1,2*). There have been numerous reports of ethylene glycol intoxication among persons drinking it during a suicide attempt, as a substitute for ethanol, or by mistake (*2-5*). These reports cite the ingestion, often by adults or older adolescents, of large amounts of concentrated solutions of antifreeze, resulting in severe illness and a high fatality rate.

The North Dakota outbreak is unusual in three respects: the toxic illness was relatively mild, the patients were mostly younger children, and the source of ethylene glycol was the water supply. Ethylene-glycol-based heating systems, which have become increasingly popular in North Dakota in the last few years, are usually designed to circulate a heated mixture of ethylene glycol and water through pipes embedded in concrete floors. These systems are most often found in farmers' workshops and auto repair shops. The most effective public health measure for preventing such exposure is ensuring that ethylene-glycol-based heating and cooling systems are not connected to the potable water supply. Systems that are currently connected to the potable water supply should be disconnected, and other methods should be used to mix water with ethylene glycol in these systems.

The only significant exposure in the New York incident occurred in the dialysis setting. It is unlikely that there was significant ingestion of the contaminated water because of the vivid green color imparted by the marker dye. Moreover, the maximum level of contamination was likely less than 0.5% because this concentration at equilibration with the dialyzed patient's blood would have been immediately fatal (oral ingestion of even 1 liter of 0.5% ethylene glycol would impart a dose of only 5 g). Neither color, odor, nor relatively low concentration of a toxin can protect a patient during dialysis. Only stringent protection of the quality of the water used in dialysis can prevent similar injury to this vulnerable population.

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Notice to Readers

Performance Evaluation Program: Testing for Human Immunodeficiency Virus Infection

CDC's Training and Laboratory Program Office (TLPO) is implementing a program to evaluate the quality and effectiveness of testing for human immunodeficiency virus (HIV) infection. This program is designed to serve as a model for the assessment of emerging laboratory technologies.

The major objectives of the HIV Testing Performance Evaluation Program are 1) to build a database of information that describes the testing practices and the physical and technical characteristics of HIV testing laboratories, 2) to evaluate the quality of HIV testing, 3) to establish an information exchange network, 4) to identify and define problems in HIV testing, and 5) to improve and maintain the quality of HIV testing.

To initiate the program, TLPO is sending an enrollment form to laboratories that participated in CDC's earlier proficiency testing program. However, enrollment in the program is open to all those that perform HIV testing and to manufacturers of HIV testing products. Participation in the program, which is not intended to satisfy regulatory requirements, is voluntary. To request an enrollment form and additional information, interested laboratories and manufacturers may telephone TLPO at (404) 329-1967 or write to Centers for Disease Control, Attention: Ms. Fern Lavinder, Training and Laboratory Program Office, DAMC, 24 Executive Park, E20, 1600 Clifton Road, NE, Atlanta, GA 30333.

Reported by: Div of Assessment and Management Consultation, Training and Laboratory Program Office, CDC.

Notice to Readers

Regional Scientific Meeting of the International Epidemiology Association, the International Clinical Epidemiology Network, and the Asia Region Field Epidemiology Training Programs – January 24-29, 1988, Pattaya, Thailand

A joint tripartite conference of the International Epidemiology Association, the International Clinical Epidemiology Network, and the Asia Region Field Epidemiology Training Programs will be held January 24-29, 1988, at the Asia Pattaya Hotel in Pattaya, Thailand. Invited plenary presentations will emphasize emerging health problems in developing countries, including primary health-care interventions, noncommunicable diseases, AIDS, and epidemiology training. Scientific papers for presentation at both plenary and concurrent sessions are invited on all aspects of epidemiologic research and investigation. The deadline for submission of abstracts is October 1, 1987.

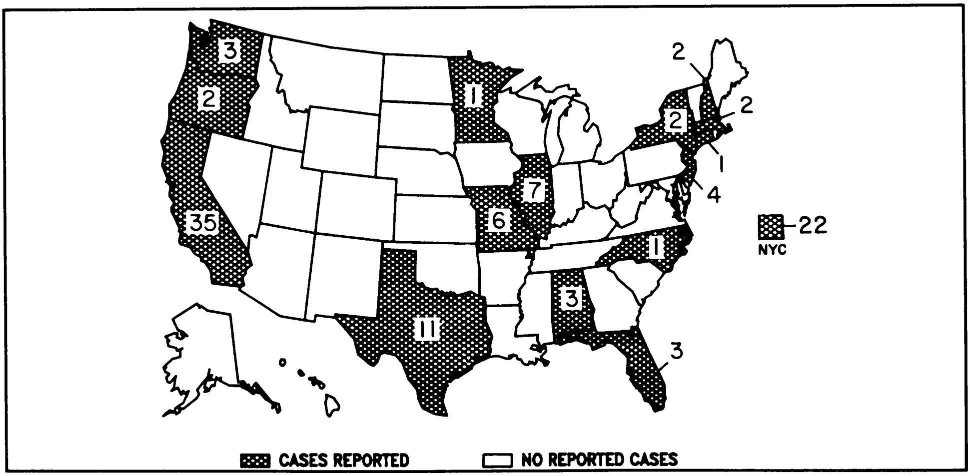
For information on submission of abstracts, registration, and accommodations, contact: Dr. Prayura Kunasol, National Epidemiology Board, Ministry of Public Health, Bangkok 10200 Thailand (Cable: THAIHELTH BANGKOK, Fax: 66-2-215-4360, Dialcom: CDC.IHPO.FETP.THAI).

Erratum: Vol. 36, No. 34

p. 566 In the figure accompanying the article entitled "Survey of Chronic Disease Activities in State and Territorial Health Agencies", the amount of state tax charged for a 20-count pack of cigarettes in Oklahoma was misrepresented. From 1979 until June 6, 1987, Oklahoma charged 18 cents. Since June 6, the charge has been 23 cents.

Performance Evaluation — Continued

FIGURE I. Reported measles — United States, weeks 32-35, 1987



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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: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

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